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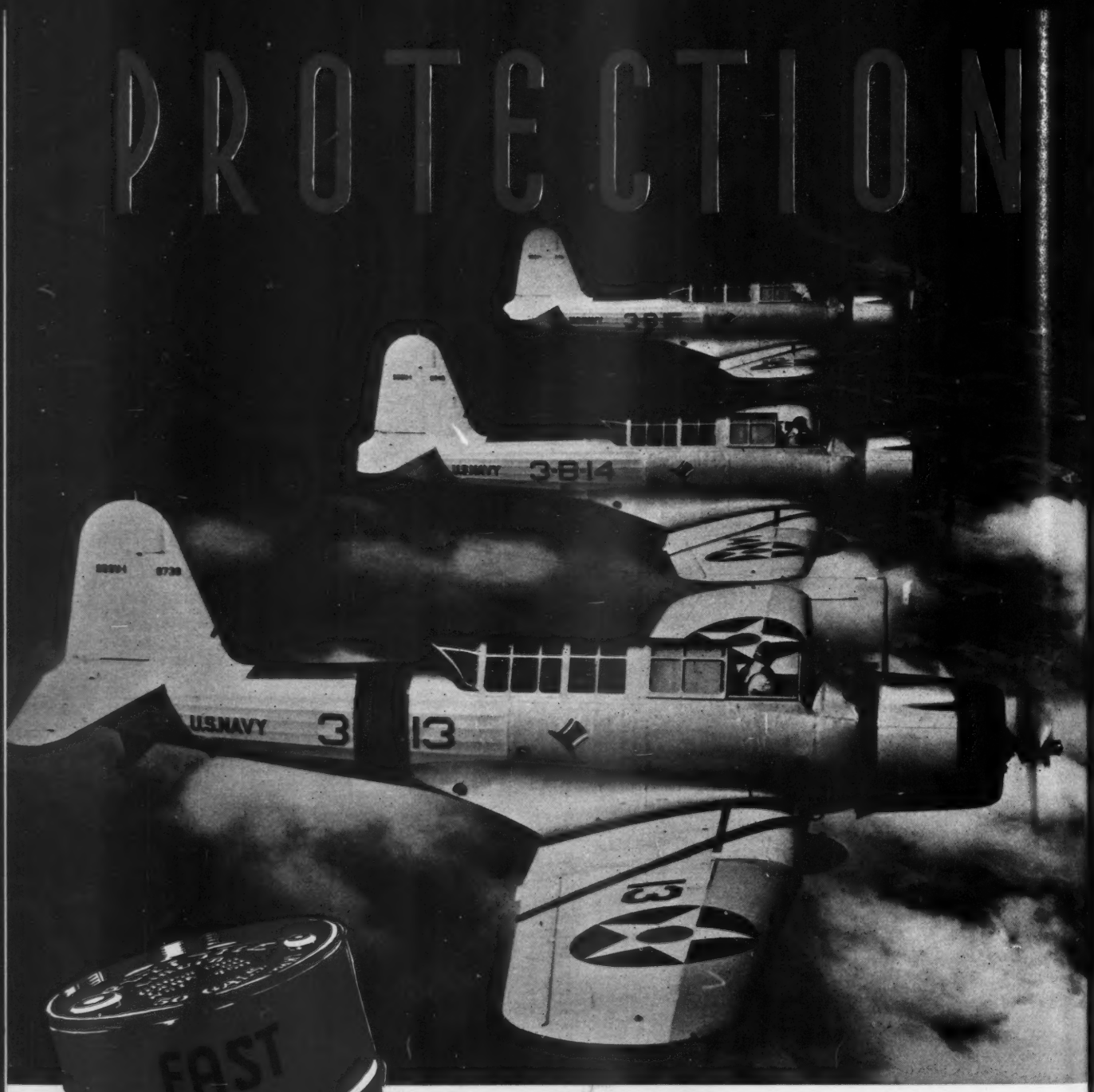

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DEHYDRATING DESALTING

Careful Planning and Budgeting

In Flood Channel Operations

By Robert New
Continental Development Corp.

In the drilling of seven wells on the west bank of Los Angeles County Flood Control Channel, stretching from Water Street north to Ninth Street, in the City of Long Beach, Continental Development Corp. began with a plan which finally amounted to a budget. When work began this plan went to the superintendent in book form with all major materials bought. In addition to those materials bought the plan included provision for purchase of additional materials expected to be needed; however, except for materials already purchased, the superintendent was allowed full leeway to buy as he saw fit, on the theory that if the superintendent could better the plan he should have full authority to do so, and if he fell behind it, obviously he was the wrong superintendent.

It was the good fortune of this company to employ Mack McGee as superintendent. He made many improvements on the original plan.

A full-sized loose-leaf folder was originally prepared, and was divided into the following sections:

1. Maps
2. Well Cost Estimates
3. Wage Scale
4. Roads
5. Derricks, Foundations, Rig Building, Etc.
6. Wiring & Electrical Installations
7. Surveys & Electrical Logs
8. Tubular Goods
9. Cementing
10. Solvents & Lubricants
11. Pumping Equipment
12. Equipment Rentals
13. Sundry
14. Tank Battery

Each section showed the items included within that general heading, the amount allocated for the purchase of those items, either the

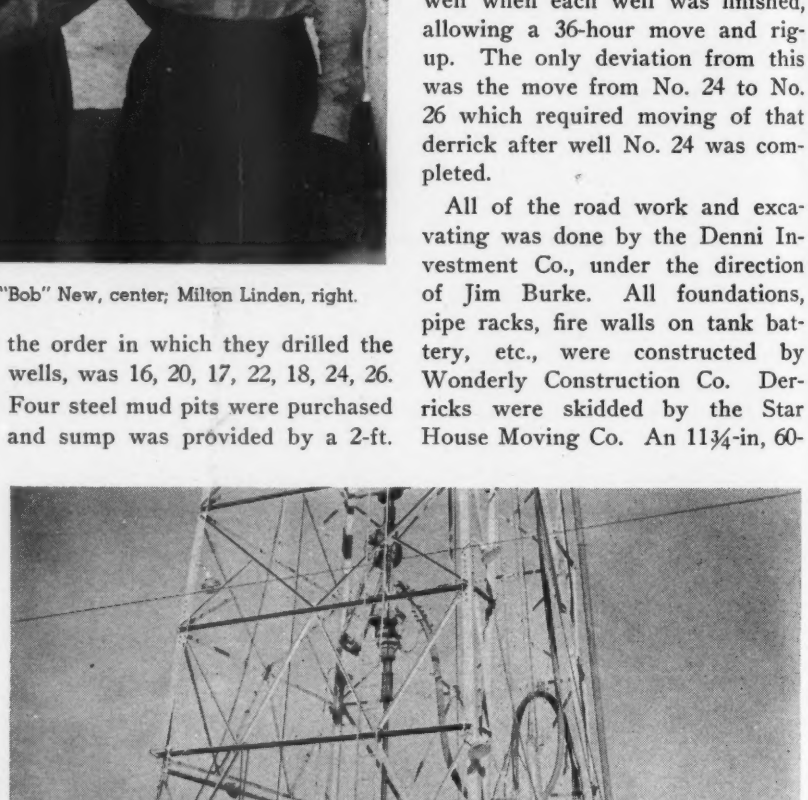
Robert New

One of the drilling crews which made Continental Development Corp.'s venerable equipment hum on the Flood Control Channel.

Mack McGee, left, gets high praise from "Bob" New, center; Milton Linden, right.

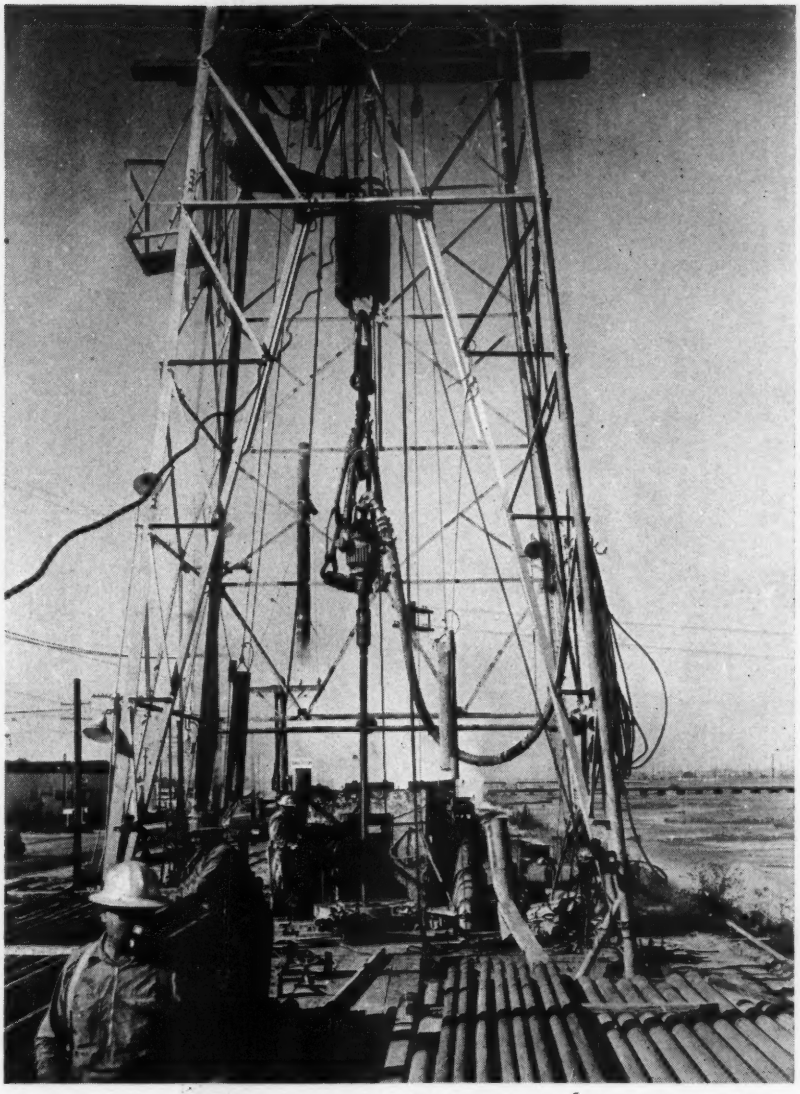
source from which it was purchased or recommended source for such purchases, costs, etc. In addition, in the plan book was a generalization which added up the total costs of the estimates to a per well cost, with about 12½ per cent leeway for sundry items theretofore uncalculated. Also, in the book was a contour map of the section. This was worked out by the engineers, F. A. Graser and R. H. Wells. There was also a detailed plan of the operation showing well locations, roads, etc. The physical layout required that a road be built on top of the levee by surfacing with decomposed granite. Two derricks were purchased (Emsco). It was necessary to use 87 foot derricks with 20 foot base because they had just 21 feet of width between clearance with the Pacific Electric Railway track and the roadway on top of the levee. One boiler set-up was made midway between wells No. 18 and No. 20, consisting of four 90 h.p. 225-pound Oil Well boilers. The drilling order, or the order in which they drilled the wells, was 16, 20, 17, 22, 18, 24, 26. Four steel mud pits were purchased and sump was provided by a 2-ft. wall between the foundation piers. At the time the foundations were poured the pumping unit bases were poured as an integral part with wood separations in the sump wall opposite the pump base for quick removal of the wall section to install the pumping unit. The derrick erected on No. 16 was skidded to No. 17 and then to No. 18. Derrick erected on No. 20 was torn down after the drilling of that well, reerected north of Seventh Street on No. 22, and then skidded to No. 24 and No. 26. In this way only one boiler setup was required and derrick, pipe rack, and mud pits were in place for the next succeeding well when each well was finished, allowing a 36-hour move and rig-up. The only deviation from this was the move from No. 24 to No. 26 which required moving of that derrick after well No. 24 was completed.

All of the road work and excavating was done by the Denni Investment Co., under the direction of Jim Burke. All foundations, pipe racks, fire walls on tank battery, etc., were constructed by Wonderly Construction Co. Derricks were skidded by the Star House Moving Co. An 11¾-in, 60-



At lower left may be seen R. R. rail, indicating proximity to the P. E. tracks.

pound conductor pipe was pile driven for about 80 feet. A 10⅝-in. hole was drilled with a Hughes Tucone bit to the shutoff point. An average of 2 bits were used to the "F" marker on each well; an average drilling time of 48 hours was maintained. An average of 310 feet of formation was drilled below the shoe with a 5⅝-in. Hughes Tricone bit, under-reamed with a MacClatchie underreamer. Five-in. Hydril full hole drill pipe with 90 feet of 7-inch OD. drill collars, was used. Cementing was with 400 sacks Colton Oil Well Slow and 100 sacks Colton Oil Well Fast, purchased from Consolidated Rock Products Co. Medium slurry was made on Colton Slow and heavy slurry on the Fast. Average setting time was 40 hours. (Special Note: 72 hours formerly required.) The plug was very hard on each drill-out. Formation tests, all successful, were by Tex Owen. They set 6⅝-in. National Seamless Oil Well casing—two strings of 20-pound, 5 strings of 25-pound. These were purchased from Curley Keim, of Oil Well Supply Co. The tubing heads were Shaffer. The pumping units were Oil Well TC-17 with Buda Engines. Pumps were Axelson 12 ft. toplock, with 1¾-in. x 2½-in. plunger, ¾-in. sucker rods. Tubing was 2½-in., (Bethlehem) purchased from Petroleum Equipment Co. All electrical installations for lighting, shaker screen, tank battery, pumps, etc., came from Signal Electric Co. Average completion time from spud-in to clean oil in the tanks was 9¾ days.



Although the equipment has seen considerable service, operations moved rapidly without a hitch.

Mechanically, probably the most unusual feature of the whole program was liners. It has long been a theory that the diameter of the liner was immaterial so long as the amounts and sizes of the perforations remained adequate and the pipe not weakened from over-perforating. Continental used 4-in. O.D., 9.1-pound Grade A, National Seamless Line Pipe for liners, and put in 12 rows, 80-mesh slots, two inch, 6-in. centers, which gave them the amount of opening usually put into 5½-in liners. Prepacking was done by Pacific Perforating, the outside being perforated rust-resistant sheet. Three-eighths inch gravel was used. B and W Wall Cleaning Guides were mounted at 20-foot intervals on the outside of the gravel packed liner and a special wash assembly of 1½ in. tubing including several inverted swab rubbers installed inside the liner. Upon reaching bottom a combination of washing and scratching effected removal of the mud from the producing section and liner. A Burns circulating-type lead seal liner hanger was used to provide a seal with the water string. Experience is such that Continental now feels this is an ideal completion for low pressure, high permeability sands. Wells average about 14.4 gravity and about 200 barrels per day, which is very slightly saline.

The entire seven wells amount to a ten-weeks physical job, and this was possible at the low cost incurred because an equal amount of time was put into the planning of the program before the physical work was started.

Three 500-barrel bolted tanks made by American Pipe & Steel Co., and a 6-ft. x 27-ft. National treater made by the same company, were

IT IS SEPTEMBER 9, 1891...

It is twilight, on an evening fifty years ago, in a young and bustling Milwaukee. Horse cars rattle through the streets, 5c beer signs swing quietly in the lake breeze. Tall-masted, broad-waisted schooners crowd the busy water front . . . And here, in this gas-lighted office, an infant industry is taking its first confident steps, as three farseeing men hold the first directors meeting of the newly-formed Chain Belt Company of Milwaukee.

THESE men had in common the belief that there was a definite need in industry for lower cost, more efficient means of transmitting power and moving materials. With a line of unique "chain belts," they purposed to fill this need.

Were they right? Did they succeed? The answer is found in Gary's roaring steel mills, in the lumber mills of the great Northwest; in the cement plants of the Lehigh Valley. It is found in Detroit's assembly lines and in the oil fields of both hemispheres. It is found wherever materials are moved, wherever power is used. In fact, there is hardly an industry which has not benefited materially through skillful and widespread use of chain belts.

Since that evening, fifty years ago, Chain Belt Company has never turned from the task of helping industry find the answer to *"how to handle it."* In doing so it has matched, stride for stride, the spectacular progress of American industry. New factories have been built, manpower has been increased, and product after product has been added to a line which now includes over 2000 sizes and types of chain belts, numerous conveyors, specialized engineering products, and a long line of construction equipment.

★ ★ ★

Baldwin-Duckworth Roller Chain Belt Division, Springfield and Worcester, Mass.; Rex Chain Belt and Transmission Division, Rex Conveying and Engineering Products Division, Rex Construction Machinery Division, Milwaukee, Wisconsin.

50th ANNIVERSARY 1891 REX 1941 CHAIN BELT COMPANY

CHAIN BELT CO.
OF MILWAUKEE

set. The treater does the gas separating and dehydrating, and supplies hot water to the tank coils for heating.

Drilling equipment consisted of a 7½-in. roller bearing Oil Well drawworks, an 11 x 11 Oil Well horizontal engine of 20-year vintage, and two Gardner-Denver 7½ x 14 pumps, vintage the same. The two derricks used are being sold immediately upon completion of the job. Servicing will be done by Mast.

Well costs, with pumps fully equipped, turned into the tanks, including roads, etc., $20,000.00 each. Tank battery, pipe lines, etc., $10,000.00.

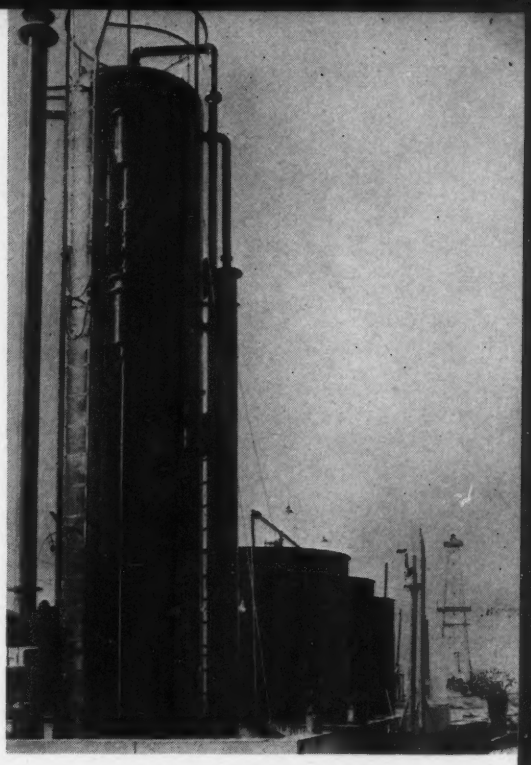
Heavy mud was used to create a good side-wall filter cake because of the rapidity of the drilling to the shoe. When hole was all made the mud was conditioned and circulated three hours. Then the electric log (Lane Wells) and magnetic survey (Lane Wells) were run in. (Special note: Combination run saves much time and expense.) When these were run Continental immediately went in with the casing without further mud conditioning.

Eastman drift indicator was run every 400 feet during drilling, and as holes were relatively straight the magnetic was run only to the shoe with drift indicator at 150 feet below the shoe and at bottom hole.

Entire job done within the budget.

Well Cost Estimates

Tubular Goods	$ 6,105
Derrick and Erection	2,500
Roads	150
Equipment Rental	1,100
Labor	2,000
Fuel, Water, Electricity	300
Cementing	525
Insurance	500
Electric Log and Survey	550
Solvents and Lubricants	50
Trucking	400
Electric Wiring	300
Taxes	100
Civil Engineering	50
Petroleum Engineering	200
Mud	100
Pumping Units	3,000
	$17,930
Sundry	2,070
	$20,000



The treater does the gas separating and dehydrating with marked efficiency.

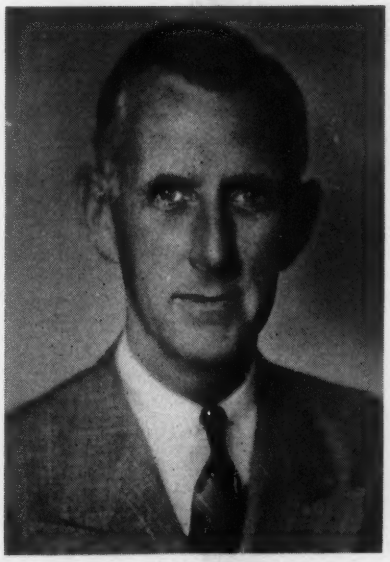
C. B. Garretson Appointed Dist. 5 Director of Marketing

Announcement has been made of the appointment of C. B. Garretson as Director of Marketing for District 5, and the opening of offices in Los Angeles by the Petroleum Coordinator for National Defense.

The Government offices, which will be headquarters for Lt. Commander W. H. Osgood, Director of Production for District 5, and others comprising the staff, are located at 855 Subway Terminal Building, 417 South Hill Street.

District 5 includes California, Oregon, Washington, Arizona, Nevada, Hawaii, and Alaska with Los Angeles as the headquarters.

Mr. Garretson is one of California's well known oil men, with a background of twenty-five years' experience with major and independent companies. He was an officer in the United States Navy during World War No. 1, was Assistant General Manager of the Pacific Coast Petroleum Agency under NRA and for the past several years has been Executive Secretary of Fair Practices Association, an industry organization.



C. B. Garretson

He was called to Washington by the Petroleum Coordinator's Office in July, where he spent two and one-half months assisting in the work being done and familiarizing himself with his new duties.

Mr. Garretson will represent the Petroleum Coordinator in marketing matters of the Fifth District, and cooperate closely with the Marketing Committee for the district headed by C. S. Beesemyer.

Rio Bravo Test Below 13,600 Ft.

Union Oil Co.'s Pacific States No. 21-33, deep try scheduled to test the Eocene at the northerly tip of the Rio Bravo oil field, resumed drilling in undisclosed formation at 13,640 ft. after making an electric log to bottom.

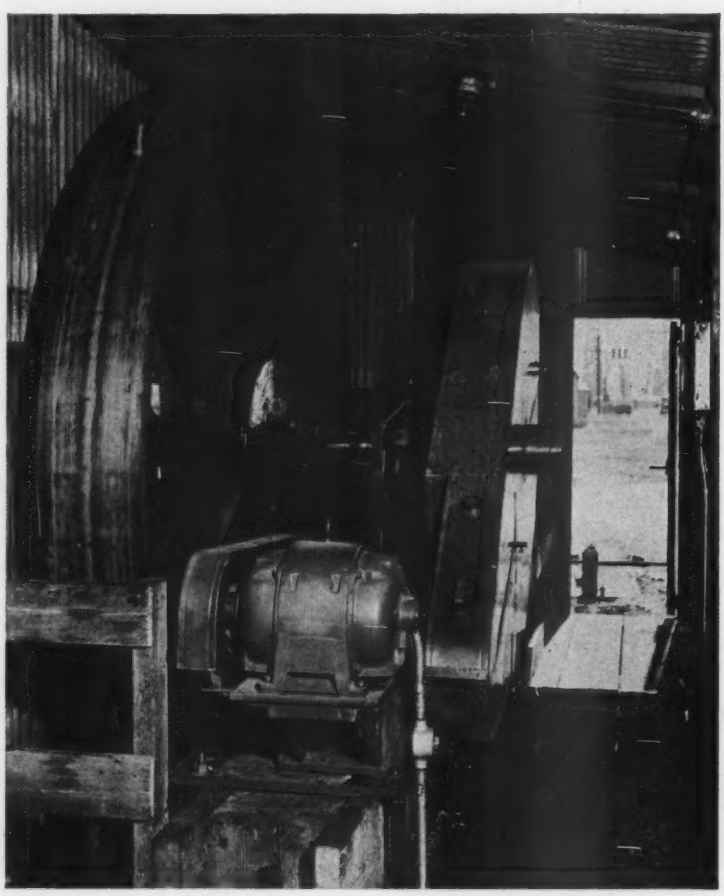
Located in the northwest corner of sec. 33,28-25, the well is carrying down to deeper horizons after the normal field zones appeared too low to be commercial. Only a few showings were found in the top of the Rio Bravo sand at 11,482 ft. while the second sand, the Vedder, was found barren at 11,555 ft.

Engineering, Technology, latest news—twice a month in California Oil World.

REDUCE PRODUCTION COSTS WITH

Electric

SLOW SPEED PUMPING



Slow speed pumping powered with a light electric motor is the answer to greater profits from many wells of low productivity.

A slow speed pump with a low horsepower motor costs less to install—much less to operate. It requires the minimum of upkeep and repairs. It gives a maximum of continuous, trouble-free service.

Yet production has been increased—in some instances actually doubled—with slow speed pumping. Get the facts about the efficiency of this modern method. Phone your Edison office.

* * *

This pumping unit is powered by a three horsepower electric motor. Not only does it produce continuously to the well's capacity, but the smooth flow of power and slow speed reduces wear and tear on the equipment.

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Elementary Principles of Corrosion

Throw Light on Prevention

By Randall Maass
General Petroleum Corp.

Mr. Chairman and members of the California Natural Gasoline Association, the object of this paper is to discuss the general elementary principles of corrosion with a view towards creating a better understanding of the important problem of corrosion prevention. The importance of this problem may best be appreciated when we realize that the annual loss to the petroleum industry in the United States due to corrosion has been estimated as approaching the $200,000,000 mark. To come closer to home, it has been estimated that corrosion is annually costing the gas distributing industries of California somewheres in the neighborhood of $5,000,000. Fortunately, considerable progress has been made, not only in the development of corrosion prevention methods, but also in understanding the nature of corrosion.

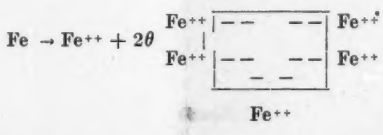
With the exception of the more nobler metals, the metals of commerce are usually found in natural deposits, not in the metallic state, but in an oxidized state—usually as oxide or sulfide ores. To reduce the metal content of the ore to the commercially desirable metallic form, as is done in the blast furnace, considerable energy must be furnished with the consequence that the element is raised to a higher energy level. Consistent with the principles of thermo-dynamics the elements in the metallic state will have a tendency to revert to one of the forms in which they are found in nature, since such a reversion would be accompanied by decrease in energy; that is, by an energy emission. The occurrence of these reversion processes may be taken as the definition of corrosion.

Corrosion reactions may be divided into two general classes; that is, those occurring in conducting mediums (such as water, and those occurring in non-conducting mediums (such as gases). In the latter class the corrosion takes place as a direct combination of the metallic and non-metallic elements and is exemplified by direct oxidation or halogenation. These reactions are illustrated below:

Primary Product	Secondary Product	Tertiary Product
$Fe + \frac{1}{2} O_2 \rightarrow FeO$,	$3\,FeO + \frac{1}{2} O_2 \rightarrow Fe_3O_4$,	$2\,Fe_3O_4 + \frac{1}{2} O_2 \rightarrow 3\,Fe_2O_3$
$Fe + Cl_2 \rightarrow FeCl_2$,	$FeCl_2 + \frac{1}{2} Cl_2 \rightarrow FeCl_3$	

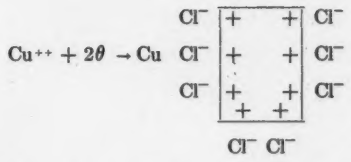
The primary ferrous compounds are not always raised to the higher oxidation levels, but the chlorine is usually found in combination with the ferric ion. Reactions of this type may be expected to occur in the presence of high temperature, dry, corrosive gases as in vapor phase cracking operations.

On the other hand, corrosion in the presence of a conducting medium (such as water) is electrochemical in nature; that is, the metal goes into solution replacing another metal or hydrogen with a consequent flow of electricity. Since this type of corrosion is the most prevalent, we will confine our attention to corrosion in the presence of water. I might add that there is some evidence that the dry reactions are also electrochemical in nature. Therefore, because of the importance of electrochemical principles in the study of corrosion, we will briefly review these principles at this time. All metals, and many other substances, when placed in water have a tendency to pass into solution in the ionic form. Thus when iron is placed in water—



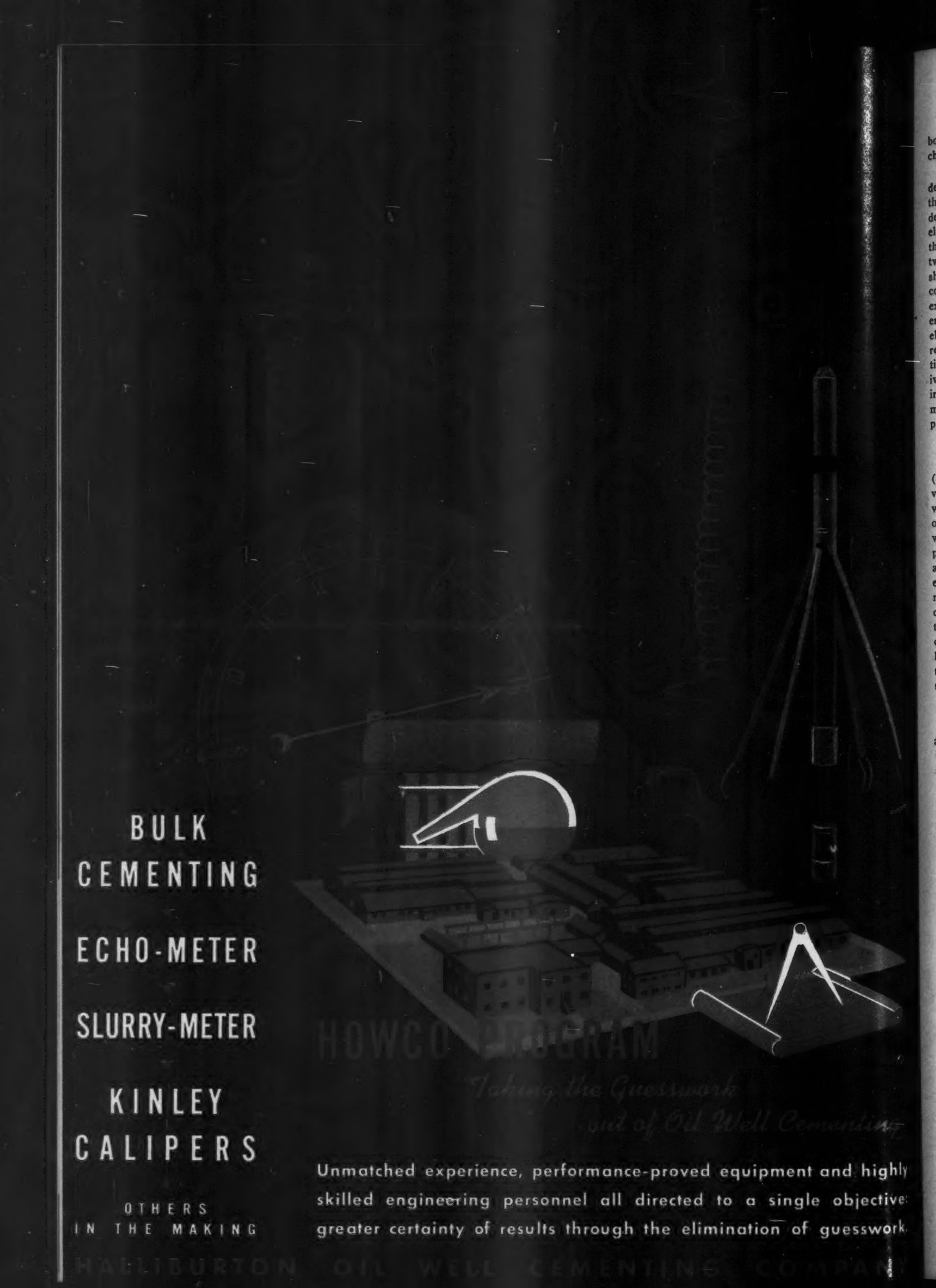
This tendency to dissolve may be compared with the tendency of liquids to vaporize. In the latter case, however, vaporization continues until the space above the liquid is saturated with its vapor. The electrostatic charge carried by the ions, however, prevents the solution process from proceeding to such an extent. In fact, almost immediately the solution in the neighborhood of the iron in our illustration becomes positively charged by the ferrous ions and the metal itself become negatively charged by the electrons left on the metal. The mutual attraction of the two charges prevents any further solution, and these charges must be removed before any appreciable solution will occur.

To return to our vaporization analogy, if the vapor has a higher pressure than the vapor pressure of the liquid, condensation will occur. In a like manner, if the ion concentration of the solution is high, the tendency to deposit may be greater than the tendency to dissolve and deposition will occur. Thus when copper is placed in a 0.1 M solution of cupric chloride—



Here again the ionic charge halts the process; the metal becomes positively charged due to the removal of electrons, and the solution in the immediate neighborhood becomes negatively charged by the chloride ions remaining.

If, in either of the above illustrations, both charges could be continuously removed, the solution or deposition would continue. Since the reactions in the above two illustrations were electrically opposite, a combination of the two should effect the continuous removal of the charges. By connecting the two solutions or electrolytes with a liquid medium some of the excess negative ions will be able to migrate from the cupric chloride solution to the ferrous chloride solution, thereby removing the excess charges of the two solutions. This connection may be effected by directly contacting the solutions as in superimposed layers. The more convenient "salt bridge", composed of a 1% salt solution in agar, effects the same liquid connection. The excess electrons on the iron electrode could be led through an electrical connection to supply the deficiency in electrons at the copper electrode thereby completing the continuous removal of the two charges. By virtue of the fact that the iron electrode possesses excess electrons and the copper electrode a deficiency of electrons whilst the restraining charges of the solutions have been neutralized, a difference in electrical potential will exist between the two electrodes. Therefore, if instead of connecting the two electrodes together we connect them to a high resistance voltmeter, this potential difference may be measured (P.D. measured: 0.5 volt). An electrochemical combination of this nature is referred to as a primary electrochemical cell in contradistinction to electrolysis cells in which the current is furnished to instead of by the cell. In primary cells the negative electrode (or the electrode that usually dissolves—iron in this case) is referred to as the "anode" and its solution as the "anolyte". The positive electrode (or copper in this case) and its solution are referred to as the "cathode" and the "catholyte". The potential difference of a primary cell is a measure of the tendency of the two electrode reactions to proceed in combination. The extent of the reaction will depend not only on the circuit resistance,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both external and internal, but also on changes in potential which may develop.

From our previous discussion it is evident that the concentration of the ions in the electrolyte should be instrumental in determining the excess or deficiency of electrons on the electrodes, and should thereby effect the potention difference between the electrodes. For example, if we should appreciably reduce the cupric ion concentration in the catholyte, we would expect a reduction in the deposition tendency and a consequent reduction in the electron deficiency at the cathode. The result would be a decrease in the potential difference of the cell. We can effectively reduce the copper ion concentration in our catholyte by the addition of ammonia, through the formation of the cupric ammonia ion complex

$$[Cu(NH_3)_4^{++}].$$

(Ammonia added & P.D. measured: 0.25 volt). The potential difference obtained would indicate a cupric ion concentration of 10^{-16} moles per liter. However, as we will point out later, as soon as the copper electrode becomes less positive than a so-called hydrogen electrode, such an electrode is formed. In this case the ammonia also suppresses the hydrogen ion concentration thereby reducing the potential of the hydrogen electrode. The concentration of the cupric ion and of the hydrogen ion can be further reduced by the addition of cyanide ion, which forms the complex

$$Cu(CN)_2^-$$

and un-ionized hydrocyanic acid. This radical reduction in cupric ion concentration and hydrogen ion concentration is sufficient to make the solution tendency of copper exceed that of iron with the result that the copper electrode becomes the anode and the iron electrode the cathode. Note that, even though we have placed the iron electrode in water free of iron, its solution tendency is less than copper in the cyanide solution. This is due to the immediate formation of the iron ions in the neighborhood of the iron electrode resulting in finite concentrations of iron ions immediately adjacent to the electrodes. Unless some drastic means, such as complex ion formation, is employed to reduce this concentration at the electrode, the electrode potential will be little affected by the small changes in ion concentration the salt solubilities will permit.

Various electrode materials have different solution tendencies and will therefore exhibit different potential differences when placed in primary cells. This will be illustrated by substituting a zinc electrode in water for the copper electrode. (P.D. noted: 0.5 volt). In this case zinc is the anode and iron the cathode; that is, the zinc goes into solution whilst the iron deposits.

A third but less appreciable factor that affects the potential differences of cells is the temperature. This factor will be further discussed later.

It is customary to compare the solution tendencies of various materials with that of a standard hydrogen half-cell. The standard hydrogen half-cell consists of an inert metal, usually platinum, over which hydrogen gas is bubbled at one atmosphere and which is placed in an electrolyte having an effective hydrogen concentration of 1 molal. The hydrogen absorbed on the inert metal behaves electrolytically quite similar to metals and is therefore called an hydrogen electrode. The electrode potential of any material is defined as the potential difference of a cell composed of this material in an electrolyte and the standard hydrogen half-cell. The electrode potentials for various familiar materials at 25°C are tabulated in Table I. The second or logarithmic term of the potentials is an adjustment for concentration and gas pressures. Note that if the concentrations in each case are effectively equal to 1 molal and the gas pressures, when present equal to one atmosphere the logarithmic terms become equal to zero. The potential is then equal to the first term which is referred to as the standard electrode potential. The potential difference of a cell composed of any two of the materials listed (in their

TABLE I

Electromotive Force Series[1] (25°C.)

Electrode	Reaction	Electrode Potential (Volts)
Aluminum	$Al \rightarrow Al^{+++} + 3\theta$	$-1.69 + \frac{0.06}{3}\log(Al^{+++})$
Zinc	$Zn \rightarrow Zn^{++} + 2\theta$	$-0.758 + \frac{0.06}{2}\log(Zn^{++})$
Chrominum	$Cr \rightarrow Cr^{++} + 2\theta$	$-0.557 + \frac{0.06}{2}\log(Cr^{++})$
Chrominum	$Cr \rightarrow Cr^{+++} + 3\theta$	$-0.50 + \frac{0.06}{3}\log(Cr^{+++})$
Iron	$Fe \rightarrow Fe^{++} + 2\theta$	$-0.441 + \frac{0.06}{2}\log(Fe^{++})$
Cadmium	$Cd \rightarrow Cd^{++} + 2\theta$	$-0.398 + \frac{0.06}{2}\log(Cd^{++})$
Nickel	$Ni \rightarrow Ni^{++} + 2\theta$	$-0.23 + \frac{0.06}{2}\log(Ni^{++})$
Tin	$Sn \rightarrow Sn^{++} + 2\theta$	$-0.136 + \frac{0.06}{2}\log(Sn^{++})$
Lead	$Pb \rightarrow Pb^{++} + 2\theta$	$-0.122 + \frac{0.06}{2}\log(Pb^{++})$
Iron	$Fe \rightarrow Fe^{+++} + 3\theta$	$-0.045 + \frac{0.06}{2}\log(Fe^{+++})$
Hydrogen	$\frac{1}{2}H_2 \rightarrow H^+ + \theta$	$0.000 + 0.06\log(H^+)/P_{H_2}^{\frac{1}{2}}$
Copper	$Cu \rightarrow Cu^{++} + 2\theta$	$+0.345 + \frac{0.06}{2}\log(Cu^{++})$
Oxygen	$2OH^- \rightarrow \frac{1}{2}O_2 + H_2O + 2\theta$	$+0.398 - \frac{0.06}{2}\log(OH^-)_2/P_{O_2}^{\frac{1}{2}}$
Copper	$Cu \rightarrow Cu^+ + \theta$	$+0.522 + 0.06\log(Cu^+)$
Silver	$Ag \rightarrow Ag^+ + \theta$	$+0.800 + 0.06\log(Ag^+)$
Chlorine	$Cl^- \rightarrow \frac{1}{2}Cl_2 + \theta$	$+1.359 - 0.06\log(Cl^-)/P_{Cl_2}^{\frac{1}{2}}$
Gold	$Au \rightarrow Au^{+++} + 3\theta$	$+1.36 + \frac{0.06}{3}\log(Au^{+++})$

The parentheses indicate molal concentrations; the letter "P" indicates pressures in atmospheres.

[1]Adapted from Lewis & Randall, "Thermodynamics", pg. 433, McGraw-Hill Book Co., Inc., 1923; and Speller, "Corrosion, Causes & Prevention", pg. 18, McGraw-Hill Book Co., Inc., 1935.

electrolytes) is equal to the algebraic difference of the tabulated electrode potentials.

Note that if any metal ion concentration were made equal to zero the potential would become infinitely negative. However, since these equations apply to the concentrations immediately adjacent to the electrodes, the immediate formation there of finite concentrations prevents these infinite electrode potentials.

Having briefly reviewed the principles of electrochemistry, we will now endeavor to apply them to the problem of corrosion. Since iron is the principal element subjected to corrosion, we will confine our attention for the present to it. When iron corrodes, it passes into solution as indicated—

$$Fe \rightarrow Fe^{++} + \theta$$

For corrosion to continue, as we pointed out above, the iron must be electrically connected to some cathodic or less negative area and the anolyte must also contact the catholyte. In waters relatively free of metallic ions, as most commercial waters are, any of the materials below iron in the Electromotive Force Series, if electrically connected to the iron, will furnish the cathodic area. An electrolyte of commercial water, common to both electrodes, whether flowing or stationary, will serve as the contacted anolyte and catholyte. In this case if none of the cathodic material is present in the catholyte to plate out on the cathode, it soon becomes less positive than an hydrogen electrode in water would be and, therefore, the hydrogen ion in the water begins to plate out as hydrogen gas—

$$H^{+} + \theta \rightarrow \tfrac{1}{2} H_2$$

The removal of hydrogen ion from the solution leaves it alkaline and, if the anolyte and catholyte are not separated, the hydroxyl ion from the catholyte may combine with the ferrous ion in the anolyte to form ferrous hydroxide; that is, hydrated ferrous oxide. Since the hydrogen gas clings rather tenaciously to most metals, the cathode soon becomes an hydrogen electrode. In fact the pressure of hydrogen on the electrode may increase substantially beyond its partial pressure above the electrode because of this tenaciousness. By virtue of this increased hydrogen pressure the electrode becomes more negative (see Table of Electromotive Forces) thereby reducing the potential difference of the corrosion cell. On the other hand, an increase in hydrogen ion concentration will increase the positive charge on the electrode and will therefore increase the potential difference of the cell. The effect of hydrogen ion at the cathode will be demonstrated by adding hydrochloric acid to the catholyte about the copper electrode of this iron-copper cell and noting the increase in the potential difference (0.25 Volt). The corrosiveness of acids is due, not so much to the small increase in potential difference, as to their ability to penetrate the protective films on the cathode. To illustrate this metallic couple type of corrosion, we have formed a couple of iron and copper and have placed them in a neutral 1% salt solution. To this salt solution we have added a small amount of potassium ferricyanide which sensitively indicates the presence of ferrous ion by formation of ferrous ferricyanide or Turnbull's Blue

$$[\,3Fe^{++} + 2Fe(CN)_6^{---} \rightarrow Fe_3\,(Fe(CN)_6)_2\,]$$

The presence of corrosion at the iron anode is therefore indicated by the deep blue color. In addition a small amount of phenolphthalein indicator has been added to indicate the presence of an excess of hydroxyl ions or a high pH at the cathode, or copper in this case. The whole solution has been solidified in agar jell to prevent diffusion, which would obscure the color reactions at the electrodes. In the second illustration Admiralty brass has been substituted for copper with somewhat the same result.

These metallic couples need not be made up of dissimilar metals. There is usually sufficient non-uniformity in a single piece of iron to furnish the anodic and cathodic areas as illustrated by this piece of cast iron (speaker illustrates). Stresses in iron serve to increase the non-uniformity of the metal. The stressed section is usually anodic as is plainly shown by the corrosion of the nail head in the next illustration. Similar stresses may be induced by hammering as this specimen of sheet iron shows. The familiar corrosion around rivet holes is a manifestation of this type of corrosion. In fact, non-uniformity of metals is one of the principal causes of corrosion, possibly because many of the more obvious and more easily corrected causes have already been removed.

In addition to pure metallic couples, iron may also form couples with non-metallic substances such as paint or iron oxide. The former illustrates the importance of obtaining a good continuous film of paint. The latter shows how corrosion may propagate itself. As a matter of fact the cathodic nature of iron rust may be a blessing in disguise, since it may tend to promote uniform corrosion and prevent localized corrosion or pitting. This is accomplished because the first anodic areas soon form iron oxide which may be cathodic to some other area, thereby reversing the procedure. This continues, repeatedly distributing the corrosion more evenly over the metal with less effect on the strength of the metal. However, if the oxide is porous in structure

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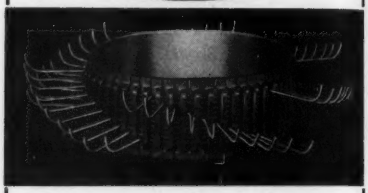

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in other words

by JOHN CLINTON

He was the maddest, reddest, largest and wettest man I've ever seen, as he stomped mightily out of the men's room at a gas station and, grabbing the operator's shirt, wiped his streaming face and hands thereon!

* * *

"Why xII$##¢%II," he yelled. "What in #&.II*¢xI" he added. Then, getting his 2nd wind he howled "If you're going to *have* paper towel containers in your rest room, why don't you *keep* paper towels in them? Am I supposed to dry by *evaporation*?"

* * *

Well, I needn't tell you that it *wasn't* a Union Oil station. It wasn't much of a station at all. But I stop at *all* kinds just to see what folks are doing.

* * *

And the moral to this incident is *not* that Union Minute Men never, never, *never* let the dispensers run out of paper towels, because they are just human. But the point is—it is only on the *rarest* occasions that these men overlook a maintenance detail.

* * *

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* * *

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or not very adherent it may aid localized corrosion as indicated below.

The presence of gases such as oxygen and chlorine serve also to set up metallic-non-metallic couples in which the gas absorbed on the metal acts as the cathode, which the Electromotive Series verifies. To demonstrate the effect of oxygen, two iron electrodes will be used on one of which oxygen bubbles will be placed. This can be arranged most conveniently through the use of hydrogen peroxide. Note that the corrosion will take place at the electrode at which the oxygen is absent. Under most conditions, such as in aeration, insufficient oxygen will be present to form an oxygen electrode. It nevertheless serves to accelerate corrosion by combining with cathodic hydrogen, which is quite reactive, to form water. By thus removing the hydrogen, its pressure is reduced and the electrode made more positive thereby increasing the potential difference of the corrosion cell. Note that in either event the corrosion is accelerated, not at the point of the oxygen contact but at the electrode marked by the absence of oxygen. This is illustrated by the corrosion of this piece of cast iron lying on the bottom of the dish. Since but little oxygen is available at the underside of the specimen it becomes the anode of the corrosion cell. This phenomenon explains the corrosion of areas protected from flowing, aerated waters—such as dead corners in flowing equipment or sections under loose rust. I wish to again emphasize that the type of rust formation is very important, since it can either prevent or accelerate corrosion. Other oxidizing agents, such as chlorine, nitrates, chromates, nitric acid, chromic acid, etc., all serve to facilitate the removal of hydrogen at the cathode and thereby increase the potential of the corrosion cell. However, when these oxidizing agents are properly used, they may serve to provide the material with a protective oxide coating. We will discuss protective coatings more at length under methods of corrosion prevention.

In addition to the above more prominent types of cells, there are several less important types which, have been suggested, play some part in the corrosion processes. One such type of cell is the concentration cell. A glance at the table of Electromotive Forces will show that iron in waters containing different concentrations of ferrous ions will have different electrode potentials. The higher the ferrous ion concentration the less negative will the iron electrode be. Therefore we should expect to find a difference in potential between iron. electrodes in different ferrous ion concentrations. However, as previously pointed out, the equations apply to the concentrations immediately adjacent to the electrode which rapidly assume finite proportions. Since the solubilities of iron salts is low there is little opportunity for large differences in ion concentrations. It takes a concentration difference of ten-fold to produce a potential difference of 0.03 of a volt. Therefore, only very small potential differences are possible in iron concentration cells. This phenomena, however, may serve to distribute corrosion throughout an iron mass by lowering the negative potential of a spot undergoing corrosion and thus causing the solution to shift to a more negative area.

The so-called oxidation-reduction cell represents another type of corrosion cell. By virtue of the fact that iron has a different potential in a ferrous ion solution than in a ferric ion solution, (See Table I) a corrosion cell may exist where a piece of iron or steel equipment is contacted at separate points by solutions of ferrous and ferric ions respectively. Here again oxygen or oxidizing agents in general may accelerate corrosion by oxidizing the ferrous ion to ferric at accessible points making them cathodic, where as at the less accessible points the iron remains in the ferrous form. Note that here again the corrosion takes place at points where oxygen is absent.

The last type of cell we will consider is the temperature cell. The effect of temperature on the electrode potential is expressed by

$$E = T \frac{dE}{dT} - \text{constant}.$$

Consequently if two iron electrodes are immersed in water at different temperatures we would expect a difference of potential to exist between the two (unless the temperature coefficient

$$\frac{dE}{dT}$$

is equal to zero. This is again readily demonstrated by heating one electrolyte to 200°F. while keeping the other at 80°F. Although only a small potential difference is obtained (0.05 volt), the larger temperature differences prevalent in boiler tubes may increase this sufficiently to foster some degree of corrosion.

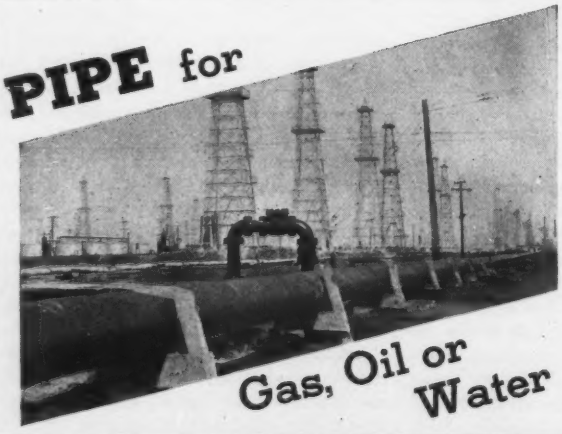
To recapitulate, we have pointed out several types of corrosion cells or corrosion couples; namely, bi-metallic couples (such as iron and brass), couples formed on metals due to non-uniformity or stresses, couples between metals and paints or oxides, couples between metals and gases such as oxygen and chlorine, and also the less important concentration, oxidation-reduction, and temperature cells. Although we have restricted our discussion somewhat to the corrosion of iron, the corrosion of other metals follows much the same pattern as that outlined

for iron. Some differences, especially in the case of alloys, will be noted in the following discussion of methods of corrosion prevention.

Our ultimate interest in this topic of corrosion is one of corrosion prevention. From our previous discussion it is apparent that to completely prevent corrosion, it would be necessary to destroy all possible corrosion cells. Obviously, this is not possible. However, certain types of cells can be eliminated or reduced in number. In other cases the highly reactive corrosion cells may be replaced by cells of much lower potential differences. And in some cases the cell may be used to protect the metal equipment.

Obviously it is most important to eliminate, by proper design and fabrication, the numerous bi-metallic couples that may exist. Having removed these bi-metallic cells there still remain the cells inherent in or on the metal itself. The composition of the metal in many cases may be modified to either eliminate the corrosion cells or replace them with cells of low potential differences. Thus in gray iron the excess carbon not combined with iron as iron carbide, is present in the heterogeneous mass as large particles which are cathodic to iron. In malleable iron, on the other hand, this excess carbon has been dispersed throughout the mass as fine particles. This more homogeneous structure does not offer the large cathodic areas present in gray iron. In steels no excess carbon is present all the carbon being combined with iron as iron carbide. Because the carbide is less cathodic to iron than carbon itself and because these areas form but a relatively small fraction of the mass, steel is not as subject to corrosion is iron. A further reduction of the carbon content reduces the corrosion tendency. It follows that if all of the non-homogeneities could be eliminated corrosion could be eliminated. Again this is impracticable. Even very pure iron has been found to have sufficient non-homogeneities, possibly different allotropic forms of iron, to foster a small amount of corrosion. Because of its cost, pure iron has very little practical importance. However, another approach to homogeneity in steels is available to use through the use of solid solutions. The term "solid solution" is self-expressive, it represents that condition wherein one or more solute solids are dissolved in a solid solvent. Like liquid solutions, this type of solid is homogeneous; that is, it has but one species of crystals. Practically, however, it is just as difficult to form perfectly homogeneous solid solutions as it is to form perfectly homogeneous pure iron. Nevertheless, it offers an approach to homogeneity for impure metals. Unfortunately, in the case of ordinary steels, the solid solution of iron carbide in iron is stable only above 1350°F. or higher, depending upon the carbon content. The addition of small amounts of other metals such as nickel, manganese, chromium, tungsten, molybdenum, vanadium or silicon to the steel, however, makes it possible by quenching to retain the metals in a solid solution at room temperatures. Since these solid solutions are retained through immobilization of the crystals by sudden cooling they are in an unstable condition. There is little evidence, however, pointing to appreciable transformation of these solid solutions to iron and iron carbide crystals. The addition of larger quantities of nickel or manganese alters the phase diagram to such an extent that the solid solution is stable at room temperature. I do not mean to imply that all alloy steels are of the solid solution type. On the contrary, most alloy steels are heat treated so as to transform the major portion of the solid solution to iron and iron carbide in order to obtain various desired physical properties. The principal commercial alloy steels of the solid solution type are the stainless steels. These steels are either nickel or chrome-nickel alloys. As mentioned above, these steels owe a large part of their corrosion resistance to their homogeneous structure which eliminates to a large extent the local corrosion cells in the metal. In the chrome-nickel steels, the formation of a thin homogeous film of chromic oxide also contributes largely to their corrosion resistance. In either event they owe their resistance to their exposed homogeneity. Many other so called "corrosion resistant" steels, such as copper-steel alloys, owe their resistance to the formation of homogeneous oxide films. Since oxides have low solution tendencies they are not subject to severe anodic solution.

Most commercial non-ferrous alloys, on the other hand, are of the solid solution type and owe their resistance to corrosion to both solid solution homogeneity and oxide homogeneity. Solid solutions have an additional property that serves as an aid to corrosion prevention. Just as solutions of iso and normal pentanes exhibit vapor pressures between those of the pure constituents and proportional to the composition of the solution, so do solid solutions exhibit solution tendencies or potentials between those of its elements and also somewhat proportional to its composition. This can be demonstrated by contrasting the potential differences of a zinc-copper couple and a brass-copper couple (0.8 volt contrasted to 0.1 volt). Thus the potential difference between the solid solution and any non-homogeneity such as copper will be reduced, but not eliminated since some corrosion, principally "dezincification," does occur. The common "dezincification" of brasses results when a small amount of the brass is dissolved by some small corrosion cell that may be present, after which more brass dissolves plating out the copper, now in solution, as spongy copper. A bi-metallic couple has now been established of copper and brass in which the brass is anodic.



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Consequently the brass continues to dissolve, meanwhile plating out the spongy copper. This dezincification could be materially hindered if the potential of the brass could be made more nearly equal to that of the copper. The addition of 1% tin in the copper-zinc alloy accomplishes this, as can be demonstrated by measuring the potential difference of a copper and Admiralty brass couple. (Approximately 0.01 volt). Even this difference, however, is sufficient to support some dezincification.

It is not always economically feasible to employ alloys either ferrous or nonferrous that are corrosion resistant. Since these alloys resist corrosion to a large extent because of the formation of an homogeneous oxide film, the formation of such films by external means should suffice. However, unless these films can be made to completely cover the metal and also to be impervious to the solution, they will serve to accelerate rather than retard corrosion, since oxides are cathodic to the metal. This phenomenon has been illustrated earlier in one of our jellied specimens. It is often possible, however, to form metal oxides of sufficient imperviousness to protect the metal. It is generally conceded that the differences in oxide films consist of different degrees of hydration, the hydrated forms in many cases being, not only the more impervious, but possessing greater mechanical strength. This is advanced as one of the reasons why dry, less hydrated, atmospheric rust forms so little protection. Note also that the externally applied films cannot repair mechanical ruptures as can films formed by constituents, present in the metal itself.

Several methods are in use to promote this protective type of film. It has been found that the film formed in alkaline solutions is more protective than that formed in neutral solutions. Similarly, the chromate ions have been found to promote a protective type of oxide film and hence have been classed as inhibitors. The effectiveness of these two methods in promoting protective films is illustrated by these two specimens in the ferroxyl jell. The first contains cast iron in an alkaline jell of a 10 pH; the phenolphthalein indicator has been omitted so as not to obscure the specimen with red color. The second illustration contains cast iron in the ferroxyl jell containing in addition 1% of potassium chromate. Note the absence of all but a small amount of blue color in these two samples. The effectiveness of chromate as an inhibitor is enhanced in alkaline solutions, and is often used in this manner as radiator compounds. To illustrate its effectiveness, we have placed sheet iron samples in straight tap water and also in water containing ½% sodium dichromate and sufficient tri-sodium phosphate to bring the solution to a pH of 10. These samples have been standing for approximately one week and the difference in corrosion is quite marked.

Another method of forming this type of oxide film is through the use for a short period of time of strong oxidizing agents such as nitric acid. The next specimen has been dipped in nitric acid for 15 minutes. Its resistance to corrosion may be readily noted.

Another type of homogeneous coating that has proven rather effective in preventing corrosion, is the ferrous phosphate film. This specimen has been immersed for one hour in a chromic acid-ferrous sulphate solution, the uniform coating obtained is illustrated by the uniform formation of ferrous ferricyanide about the sample. The absence of corrosion is indicated by the absence of any pink cathodic areas.

Oxide coatings may also be formed by making the metal the anode in an electrolytic cell. If sufficient voltage is imposed upon the cell the metal will not only dissolve, but oxygen will also be formed which will combine with the metal to form the oxide film. The character of the film can be varied by the current density and type of electrolyte employed. This anodic oxidation process is used quite extensively to coat aluminum. In addition to a protective value, aluminum oxide also has a decorative value. The oxide may be left as formed or it may be colored with various dyes. The effectiveness of the anodic aluminum oxide film is demonstrated by the electrolytic rectifier in which the aluminum oxide coating on an aluminum electrode prevents any further solution of aluminum and thereby prevents the passage of positive current. The hydrogen ion, on the other hand, because of its size, is able to penetrate the film when the electrode is negative, thereby permitting negative electricity to pass through the film. The hydrogen ion is ultimately released as hydrogen gas. By a proper arrangement of four such aluminum oxide electrodes and four inert electrodes, both halves of the alternating current cycle may be rectified to direct current. We have constructed a rectifier of this type and the resulting direct current is illustrated by the constant direct current voltmeter reading.

An additional method of forming an adherent oxide coating on iron is that in which superheated steam is passed over the iron to form the magnetic oxide. Iron treated in this fashion is known as black iron or Russian iron.

The use of paints in corrosion prevention consists of two types; those offering mechanical protection only and those offering in addition some corrosion

inhibition. In the paints offering only mechanical protection, such as the sulphate and carbonate base paints, great care must be exercised to obtain a continuous impervious film since, as we have shown, paint films are cathodic to iron. This is most readily effected by the use of two coats of paint. One-half of the panel enclosed in this jar has had but one application of a non-inhibitive paint; the other half has had two applications. The pin-holes in the single coat section are indicated by the blue spots of ferrous ferrocyanide.

When inhibitors are used in the paint the porosity of the paint film is not so important. Many inhibitors for paints are selected so as to serve a double or triple purpose. Thus zinc and lead chromates, zinc oxides and red lead serve not only as inhibitors but also as pigments and to lend opacity to the paint. Iron oxide is used both as a pigment and as an inhibitor. The effect of the inhibitor is demonstrated by the smaller amount of corrosion on the scratch through this "synthetic red lead" paint than on the scratch through the above non-inhibited paint.

Metal coatings may also be divided into the same two types. Naturally those metal coatings cathodic to the body metal would furnish only mechanical protection, whereas the metal coatings that are anodic to the body metal would be expected to furnish in addition anodic protection. An impervious-film of a cathodic metal coating is just as important as an impervious film of the non-inhibitive paint and for the same reasons. The porosity of tin-plate, which is of the cathodic coating type, is illustrated by the ferroxyl test on this piece from a tobacco can. Of the anodic coatings zinc is one of the most important. The effectiveness of its protection is illustrated by the ferroxyl test. Note no blue is in evidence on the strip connected to the zinc, but only on the piece not so connected. Note also that the iron is entirely surrounded by red alkaline color indicating its cathodic nature. The white solid in the neighborhood of the zinc is zinc ferricyanide. It might be expected that aluminum would form an anodic coating on iron because of their relative positions in the Electromotive Force Series. This is not the case, however, since the aluminum is readily oxidized and the aluminum oxide is more or less neutral to iron. This is also illustrated by the ferroxyl test.

The anodic protection of iron by zinc doesn't always take the form of zinc coatings. The zinc is often used in boilers and coolers in the shape of a zinc plug which contacts the iron to be protected. These zinc plugs are often expected to protect a rather extensive area. A somewhat qualitative illustration of the effectiveness of zinc in this regard may be shown by the protection this small zinc strip affords this 4-foot length of cast iron rod. Note that the rod is protected but half its length by the zinc strip at one end. Unless the zinc thus used is very pure, the impurities left behind will soon form a protective film over the remaining zinc, making further solution difficult if not impossible. This difficulty can be alleviated to some extent by amalgamating the surface of the rod. The amalgam dissolves the zinc and brings it to the surface leaving the impurities behind. The potential of the saturated zinc amalgam is substantially the same as that of pure zinc.

No discussion of corrosion preventative methods would be complete without at least a reference to the cathodic protection of pipelines. Some soils appear to be cathodic to steel pipe lines, others appear to act only as the electrolyte, thereby fostering "local corrosion" action on the pipe. In either event the solution of the metal with the consequent excess of electrons at certain areas of the pipe may be restrained by furnishing the pipe with an excess of electrons from an external source, since it is a common law that a reaction may be hindered by increasing the concentration of at least one of the reaction products. Thus an excess of electrons hinders the reaction

$$Fe \rightarrow Fe^{++} + 2\theta$$

The pipe is then made the cathode of an electrolytic cell and the charge is somewhat dissipated by the formation of hydrogen gas from the hydrogen ion in the soil water. Cheap iron anodes are placed at regular intervals along the line to furnish the second electrode of the cell. Some solution of the anode iron may be expected, but excessive solution is prevented by impressing but a small potential difference of the proper direction upon the electrodes. This cathodic protection can be demonstrated in a crude way by connecting a zinc-copper cell to an iron-copper couple so as to cathodically protect it. (Illustration No. 20).

We have considered some of the methods of corrosion prevention and it might not be amiss to consider some items that foster corrosion. One of the first corrosive materials we think of is an acid, and we usually picture the acid as attacking the metal directly. On the contrary, the acid merely facilitates the removal of hydrogen at cathodic areas. It does this because it makes the hydrogen electrode more positive and because it can so readily permeate the liquid as well as the solid films about the cathode. To combat this ability of the hydrogen ion to permeate films, an organic inhibitor is often used. These organic compounds are polar in nature and attach themselves to the iron at one end of their long molecule. If sufficient inhibitor is present, these closely packed long molecules presumably form a mat which resists the invasion of the hydrogen ion. A specimen of Admiralty brass has been immersed in 50% hydrochloric acid to which an organic inhibitor has been added. After seven days, no visible attack has occurred, whereas a similar specimen in uninhibited 50% hydrochloric acid has been half dissolved.

To the items that foster corrosion we must add the chloride ion. The chloride ion aids corrosion by acting as a conductor of electricity through films which it can readily permeate. The power of the chloride ion to penetrate oxide films explains the corrosiveness of sea water.

To summarize, it has been pointed out that corrosion, in conducting mediums at least, is electrochemical in nature and that the extent of the corrosion is determined, not only by the potential difference of the existing cells, but also by the resistance of the circuit, in other words, by the current that flows. Several typical corrosion cells have been discussed and finally various means of eliminating corrosion cells or of replacing them by less drastic cells have been considered. It is my hope that this somewhat elementary discussion of the topic of corrosion may serve to reawaken your interest in corrosion and its prevention.

In closing I would like to thank Dr. Lacey and the Institute for the cooperation they have given me. I also wish to thank my assistant, Robert Allen, for the help he has been to me in presenting these demonstrations. I thank you.

●

C. N. G. A.

This paper was presented

at the October meeting

of the

California Natural Gasoline

Association

in

Los Angeles

●

THIS LAUGH OFF!!

Since we heard **"Duke" Thornburg's** story, we've wondered why it doesn't happen more often:

"Now look here, I fired three girls for revising my letters, see?" said the boss to his new stenographer.

"Yes, sir."

"All right, now take a letter and take it the way I tell you."

And the next morning Mr. O. J. Squizz of the Squizz Soap Co., received the following letter:

"Mr. O. K. or A. J. or something, look it up, Squizz, what a name, Soap Co., Detroit, that's in Michigan, isn't it? Dear Mr. Squizz, Hmmmmmmm. you're a hell of a business man. No, start over. He's a crook, but I can't insult him or the bum will sue me. The last shipment of soap you sent us was of inferior quality and I want you to understand—no, scratch that out. I want you to understand—Hmmmm—unless you can ship—furnish—ship, no, furnish us with your regular soap, you needn't ship us no more period or whatever the grammar is, and pull down your skirt. This damn cigar is out again.

"Where was I? Paragraph. Your soap wasn't what you said — I should say it wasn't! Them bums tried to put over a lot of hooey on us. Whadda you flappers want to paint your faces up like Indians on the warpath? We're sending back your last shipment of soap tomorrow. Sure, we're gonna send it back. I'd like to feed it to 'em with a spoon and make them eat it, the dirty bums. Now read the letter over—no, don't read it over we've wasted e n o u g h time on them crooks, fix it up and sign my name. What do you say we go out to lunch?"

Gals who sleep in pajamas
Ain't so likely to be mammas.

The two Tommies were back from the battles in Africa, and as they neared their homes one of the weary soldiers asked the other:

"Well, Archie, what's the first thing you're going to do when you get home."

"Well, my wife will be waiting for me, and, say, what's the first thing you're going to do?"

"Same thing, and then I'm going to take this cursed heavy pack off my back."

Back to monetary problems **Harry Wirshing** recounts this story:

A seedy individual entered the bank in the grand manner. In his grimy hand he held a check for fifty cents. He approached the cashier's window and presented the check with a flourish.

"Here, my good man," he said loftily, "you will kindly cash this for me. And, mind you. I haven't all day to wait."

The busy cashier glanced up. He took the check, examined it, then reached into the change drawer.

"How will you have it, sir?" he asked. "Heads or tails?"

Then, there's the Texan who was sent to the drygoods store to buy his wife a brassiere. He was having some difficulty describing the proper size, but the young saleslady was very helpful.

"Would you say 'they' are as large as lemons," offered the saleslady.

"No, mam."

"How about oranges?"

"No, mam."

"Well, then, grapefruit?"

"No, mam. But lady, have you ever seen a Cocker Spaniel's ears?"

Names used on this page are entirely fictitious, and any resemblance to persons either living or dead is purely coincidental.

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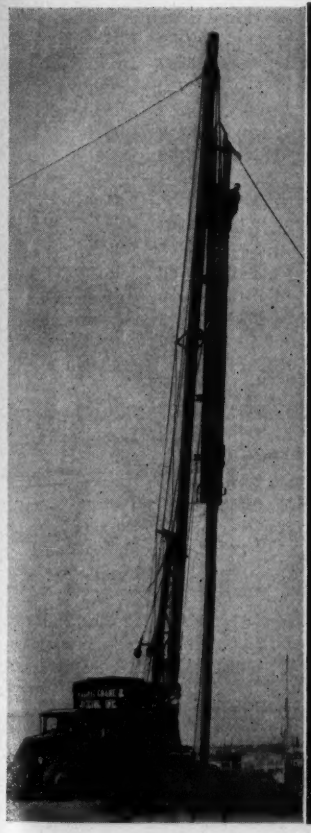
A bright future for California petroleum was envisioned by members attending the annual meeting of the American Association of Petroleum Geologists, Pacific Section, in Los Angeles, Oct. 16-17. At left are D. B. Myers and Stanley C. Herold. At right are Bart Gillespie, Tom Stipp and Carlton M. "Kit" Carson. Below are two "candid" shots taken at the sessions.

The president of A.A.P.G., Edgar W. Owens, of San Antonio, Texas, chats pleasantly in deka-syllabics with, to his left, Dr. Chester A. Stock, Cal Tech, and Drs. Hubert Schenck and Aaron Waters, of Stanford.



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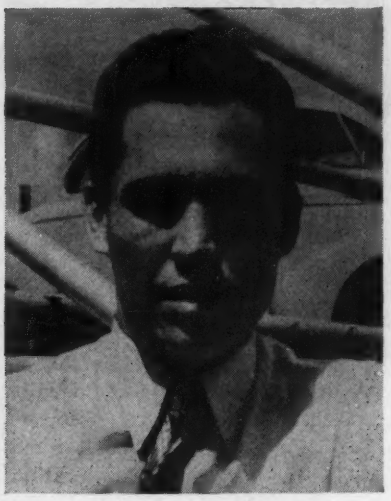
Applying Finishing Touches At Douglas Oil & Refining

Finishing touches are being applied this week to the numerous large installations made by J. B. Gill Corp. at the



Glenn Gill

Douglas Oil & Refining Co. plant in Los Angeles. This work is under the supervision of Glenn Gill, son of the head of the contracting and construction corporation.

In the First Issue, September, 1941, California Oil World presented a lengthy description of this new refinery. As this description was almost entirely devoted to technical and engineering features of this first refinery in California built exclusively for the production of high octane gasoline of aviation grade, the writer overlooked an important item in failing to mention the designers and builders of a major portion of the refinery's equipment, J. B. Gill Corp.

With Glenn Gill in charge, this company designed and installed the clay treating system, acid wash, loading racks and facilities at the refinery proper, connected the manifolding and pipe line connections on all tankage, designed and installed a special treater, built additional hot oil furnaces, and furnished the design, but did not build, the ethyl plant.

Round Mt. Wildcat Looks Discouraging

John Pankratz's J.P.R.-Coffee No. 1 in sec. 2,28-28, off the tip of the Round Mountain field, appears to have missed production and is presently bottomed in sandy silt at 1970 ft. Vedder sand showing oil stains at the top was cored from 1844 to 1851 ft.

Field Development

Los Angeles Basin

Shell Oil Co. Stakes Aliso Wildcat Location

A little to the north and a mile to the east of Tide Water Associated Oil Co.'s Mission No. 1, Shell Oil Co., Inc. has surveyed a location for a new wildcat to be called Mission No. 2-1. Drilling operations will start as soon as road rights of way can be obtained and equipment installed. The new project is approximately three miles northwest of the two Mission wells drilled by Shell 14 years ago.

Tide Water Associated Oil Co.'s Mission No. 1, half way between Shell's new test and the Aliso Canyon field, is drilling and spot coring at 5430 ft. Porter No. 26, Tide Water's westerly field outpost, stopped drilling at 6370 ft. to change equipment. The well apparently is headed for the deep zone discovered last year by Porter No. 12 which was completed at 7550 ft. flowing 225 bbls. of 55 gravity oil and a large amount of gas through a 32/64 in. bean.

Continental Discovers New Puente Hills Field

Fulfilling the promise of formation tests, Continental Oil Co.'s Turnbull Community No. 1 was successfully completed on the pump to discover a new Puente Hills field. On production only a few days at press time, no accurate estimate could be made of the well's potential as gas locking persistently hindered pumping operations. Best indication of what may be expected, however, was a 19 hour period when production was at a 206 bbl. a day rate of 25.2 gravity oil cutting 4.1 percent. Company officials estimate that several days more will be required to completely eliminate the gas trouble and make the well a steady producer.

Mechanically, Turnbull Community No. 1 is completed at 3447 ft. with 7 in. casing cemented at 3270 ft. and 244 ft. of 5 9/16 in. liner including 70 ft. perforated landed on bottom and cemented through perforations at 3373 ft. Official completion date was October 18th when the well was first put on the pump.

The new productive horizon is Miocene in age and lies approximately 1700 ft. below the Repetto-Miocene contact. Several sand phases were encountered above the one now

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Rankin & Williams	1	7, 3-13	9483	Idle
Castaic	Young, Roy, W., Inc., Walker	1	11, 4-16	5232	Drilling
	The Texas Co., Fernando	1	11, 4-17	280	Drilling
Coyote—West	The Texas Co., McNally	A-1	22, 3-11	9000	Abandoned
Newhall	Aztec Oil Co., Sanborn	1	6, 3-16	6113	Idle
	Barnsdall Oil Co., Limbocher	1	17, 3-16	3440	Drilling
	Kenneth Oil Prod. Co., Shepard-Roy	1	34, 4-15	2165	Idle
	Rankin & Norell, Ferguson	1	31, 4-16		Rig
	St. Anthony Oil Corp., Lassalle	1	10, 3-16	5416	Idle
	Tunnel Oil Co., Needham	1	13, 3-16	1760	Idle
Palos Verdes	Newton Dev. Co., Palos Verdes	1	13, 5-15	3970	Idle
	Surety Holding Co.	1	22, 5-14	965	Cleaning out
Puente Hills	Altchuler, Louis B., Larry	1	30, 2-9	1255	Abandoned
	Axis Pet. Co., Tandberg	1	13, 2-11		Location
	Continental Oil Co., Turnbull Comm.	1	13, 2-11	3447	Rigging pump
	Kosanke, J. F., Dragna	1	24, 2-10	1822	Idle
	Los Nietos Valley Oil Co., Woodward	1	29, 2-11		Rigging up
	Sunset Oil Co., Baldwin	1	11, 2-11	4681	Testing
Rio Hondo	Potrero Oil Co., Well	1	32, 1-11		Rigging up
San Fernando	Imperial Corp., Rolland Lee	1	25, 2-17		Foundation
	Shell Oil Co., Mission	2-1	25, 3-16		Location
Whittier-La Habra	Fullerton Oil Co., La Habra	9	25, 2-11	2453	Fishing bailer
	Fullerton Oil Co., La Habra	10	25, 2-11	2780	Stdg. cem.
	Union Oil Co., Sansinena	13	30, 2-10		Rig
	Orange County				
Bolsa Chica	La Bolsa Ro. Oil Synd., Well	1	22, 5-11		Rig
Costa Mesa	Thompson, Milton N., Banning	1	9, 6-10	5649	Redrilling
Seal Beach	South Basin Oil Co., S.B.J.A.	1	6, 5-11	7878	Drilling
	San Bernardino County				
Chino	Prado Oil Corp., Lamp	1	32, 2-7	1733	Idle

being produced, the best of which was from 3270 to 3340 ft. where a formation test recovered a large volume of fluid containing 50 per cent oil testing 20 gravity. This zone is below the shoe of the 7 in. casing and may be gun perforated later if desirable. Conservative preliminary estimate place the recoverable oil figure at 25,000 bbls. per acre.

Continental Oil Co. holds a total of 500 acres surrounding the discovery well, at least three hundred of which should ultimately prove productive. Second largest lease holder is Axis Petroleum Co. of Long Beach.

Much credit goes to Continental's geological department, headed by Roy Barnes, for making a worthwhile discovery in an area long avoided by other major operators.

Though development plans as yet are far from concrete, Continental Oil Co. is preparing to move its new portable drilling rig from Seal Beach where it is now finishing a deep water well. Designed by Continental engineers, the outfit incorporates the latest innovations in this type of equipment.

Castaic District Progress Reported

With two wells reaching critical depths, the interest of Castaic operators is centered at present on the Oak Canyon area where two producing horizons were discovered this year by Western Gulf Oil Co. South and west of the east quarter corner of sec. 31,5-17,Western Gulf Oil Co.'s Geo. Wickham No. 1 is below 5700 ft. while Hathaway Co.'s Ram No. 2, located half a mile to the west, has passed the 6500 ft. mark. These two wells, together with Western Gulf's deep zone discovery well, Lechler No. 2 which is 1500' north of Wickham No. 1, form a triangle that will throw much light on subsurface structure and general conditions. The deep zone was topped in Lechler No. 2 at 6920 ft.

As is often the case in the early development of new fields, troubles are besetting operations at Del Valle. In the Discovery Area, R. E. Havenstrite has experienced difficulty in shutting off water in Barnes No. 1 and Lincoln No. 8, both of which show lots of kick and should eventually become good producers. In the former, gas blew out between the surface casing and the water string necessitating a "c.p." job at 1900 ft.

In the west extension portion of Del Valle, Bankline Oil Co. bottomed its deep test, Videgain No. 101, at 7700 ft. after reporting only a few thin streaks of oil sand between 7490 and 7542 ft. and plugged to 6158 ft. to complete in the established horizon. The first production test resulted in a 450 bbl. flow, half of which was water testing 800 grains of salt per gallon, and steps are being taken to locate and cement off the water.

Only Del Valle driller at present is Havenstrite's Liebhart No. 1, an easterly outpost, but continuance of

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drilling is assured by Ohio Oil Co., Standard Oil Co. and Herley-Kelley grading locations in the west area and Havenstrite's erecting rigs for Lincoln Nos. 9 and 10 in the discovery section.

The status of wildcats in the Newhall-Castaic region has changed but little of late. Barnsdall Oil Co., Bandini Petroleum Co. and Ambassador Petroleum Co. are making slow progress in their joint test, Limbocker No. 1, in Towsley Canyon. Bottom was last reported at 3450 ft. and only showings were thin streaks of oil sand at 3060 ft.

Two miles southeast of the Newhall-Potrero field, Aztec Oil Co.'s Sanborn No. 1 was tested in the interval 5895-6113 ft. recovering brackish fresh water. Arrangements are being made to continue drilling.

Northeast of Del Valle, in Hasley Canyon, The Texas Co. spudded Fernando No. 1 in sec. 11,4-17.

Roy W. Young, Inc.'s, Walker No. 1 in Boquet Canyon passed through a conglomerate bed at 5000 ft. and entered what is said to be Miocene shale of marine origin at 5078 ft. Last reported drilling at 5232 ft., the well is now at one of its most interesting stages.

Three-quarters of a mile north of the Aztec well, a concern variously reported as Rankin & Norell and Schmerdeman, Bennett & Associates has built a derrick.

Standard, Jergins Finish Deep Inglewood Producers

Flowing 1150 and 850 bbls. respectively, Standard Oil Co. and Jergins Oil Co. each completed good wells recently in the deep zone at the north end of Inglewood. First to come in was Standard's Vickers No. 2-13, bottomed at 8401 ft. and finished with 272 ft. open. The initial rate was registered with a 32/64 in. bean in the flow line which also held the gas rate to approximately 900,000 cu. ft.

Following closely on the heels of Vickers No. 2-13, Jergins Oil Co.'s Howard No. 2 was brought in with 511 ft. of formation open to bottom at 8423 ft. This is the first well to set perforated pipe opposite the Nodular Shale high pressure gas horizon. This well produces clean oil of 32 gravity while Standard's project was slow in cleaning up and at last reports was flowing 28 gravity oil cutting 5.0 percent.

Two wells that were unsuccessful on first completion attempts will soon be ready for a new try at commercial production. Federal Oil Co. Smith No. 2 is redrilling and deepening after experiencing some difficulty in getting away from the old hole and The Texas Co. R. C. Smith No. 8 is redrilling near the 7000 ft. level after whipstocking out at 6575 ft.

Preparing to complete as this is written is Standard Oil Co.'s Vickers No. 2-12, bottomed at 8300 ft. Casing was cemented at 7700 ft. and a liner containing 371 ft. perforated was landed and cemented through perforations at 7917 ft. Hogan Petroleum Co.'s Machado No. 3-A is coring at 8000 ft. after setting casing at 7771 ft.

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Barnsdall Tests R. S. F. Outpost

Barnsdall Oil Co is testing Rancho San Francisco No. 26, a northwesterly outpost well at Newhall-Porero, after bottoming at 7830 ft. and setting casing at 7475 ft. Located on the westerly flank of the northerly extension of the field, the well is interesting because of its apparent low structural position.

Long Beach Well Pumps 170 Bbls. a Day

Most spectacular of the many recent plugging jobs at Long Beach was The Texas Co.'s Robinson No. 4 located south of Burnett St. and West of Cherry Ave. An old well, the casing was perforated at intervals from 2740 to 2860 ft. and returned to production making 68 bbls. of 26.5 gravity oil cutting 12.0% in 12 hours, later building up to 170 bbls. cutting 6.0%. Results of this job are expected to further stimulate exploitation of shallow Signal Hill zones.

Drilling Contract Let For New La Bolsa Test

La Bolsa Rancho Oil Syndicate has let the drilling contract for its first well east of the Meadowlark Golf Club to Dunlap & Graham of Long Beach who expect to start rigging up immediately. Derrick has been erected in the southwest corner of sec. 22,5-11 north of the westerly end of Huntington Beach.

Potrero Spudding Rio Hondo Project

Seeking a new field north of the east end of Montebello, Potrero Oil Co. is spudding its wildcat near the banks of the Rio Hondo.

Huntington Beach Development Steady

Development in the Huntington Beach field is maintaining the steady rate of the past few months with five strings of tools running constantly. On the Brooks lease, Harold C. Morton is completing No. 3 and drilling No. 4, Herb Kohlbush is placing his Pacific American No. 8 on the pump and West American Oil Co. is preparing to drill Ashton No. 9 Continuing development of their large properties, Signal Oil Co. and Southwest Exploration Co. are drilling Signal-Bolsa No. 31-A and State No. 42 respectively.

Results of recent drilling have been particularly encouraging with Signal obtaining better than 200 bbls. a day in the 2910 ft. No. 32-B, Southwest Exploration a potential of 890 bbls. in State No. 28 and West American Oil Co. 130 bbls in Ashton No. 8.

Tronylm Oil Co. has not spudded its eastside test, derrick for which has been erected on a portion of the old Standard Oil Co. Surf lease.

A return of activity to the Five Points area is indicated in the report that John H. Marion will soon drill south and east of the intersection of Huntington Beach Blvd. and Ellis Sts.

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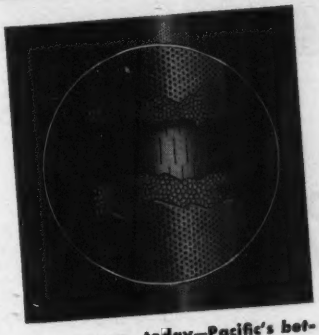

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Getty Spudding Athens Project

J. Paul Getty, returning to his former role as an individual operator, is spudding in his first venture at the intersection of 124th St. and Hoover at Athens. The well will be drilled to the 8000 ft. zone now being produced by Thorley Oil Co. and Southern California Petroleum Corp. in the same block.

Northwest of the Getty site, Southern California Petroleum Corp.'s St. Anthony No. B-1, with bottom plugged to 8100 ft., is producing an estimated 100 bbls. daily.

Near the intersection of Rosecrans Ave. and Figueroa St., Universal Consolidated Oil Co. is testing Trust No. 2 which was redrilled and deepened to 8185 ft. In the same area, Barnsdall Oil Co. is rigging up O'Dea No. 21.

Westport to Drill Wilmington-Torrance

Westport Oil Co., headed by D. D. Dunlap of Long Beach, is preparing to drill its first Wilmington-Torrance well at the southwest corner of "Q" St. and Frigate. The location is just north of Silver Petroleum Co.'s No. 2 in the proved area. Farther west Bristol Oil Corp. has derrick up on Spring property and The Texas Co. is ready to rig up Oakley No. 7.

Almost linking the Wilmington-Torrance area with the main Wilmington field, Barnhart-Morrow Consolidated have a derrick up at the corner of State St. and McDonald.

West of Figueroa St., First National Finance Corp. brought in its Capital No. 2 at the initial rate of 140 bbls. a day. Three intervals are perforated from 3130 to 3715 ft.

Texas Co. Plans Anaheim Wildcat

With the La Mirada wildcat, McNally No. A1 abandoned at 9000 ft., The Texas Co. is planning to drill Spencer No. 1 as another test in the vicinity of Anaheim. Located in the northeast corner of sec. 1,4-11 the project is midway between Buena Park and the company's No. A-13-1 which drilled to 8977 ft. in the early part of 1939. A formation test in the previous try recovered a little heavy oil from the interval 7885-7915 ft., which, together with showings found by Shell Oil Co. in Harbeson No. 1 and Mathis No. 1, gives reason to hope for a discovery in the Anaheim area.

The Texas Co.'s McNally No. A-1, located in sec. 22,3-11 at La Mirada Station, found numerous streaks of barren gray sand and bottomed in Repetto shale at 9000 ft. No oil showings were found.

White Point Well Resumes Drilling

Surety Holding Co. has resumed operations in its wildcat at White Point and is preparing to deepen from 1000 ft. The well is located two miles west of Point Fermin on the ocean bluff at the south end of the Palos Verdes Hills.

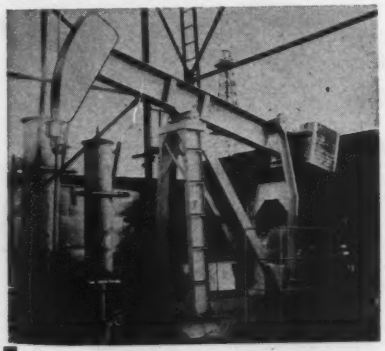
Newton Development Co.'s Palos Verdes No. 1, located northwesterly along the coast line from the Surety well, is suspended at 3970 ft. with bottom reportedly in schist. This is the deepest hole drilled with cable tools in the Los Angeles Basin in many years.

Dominguez Outpost Draws Attention

With activity at the west end slowed to a walk, the most interesting project at Dominguez is Carson No. 17 which Union Oil Co. is drilling as a semi-wildcat south of Victoria Avenue and east of Avalon Blvd. Following its customary procedure on critical wells, Union Oil Co. releases but little data on formations encountered, the only clue as to the well's position being the rumor that the Eighth Callender zone was topped at 8400 ft. This, if true, places the well rather low structurally when compared to wells in the westerly area. Bottom at press time was approximately 9000 ft.

Standard Raises All Employees' Pay

Following meetings between representatives of the employees and the management of Standard Oil Co. of California, the company announces a basic advance in compensation of $10.25 per month. Approximately 11,000 employees are affected. The increase is retroactive to September 1. This advance follows an increase of forty cents per day to approximately 10,000 employees, effective May 1, 1941.



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San Joaquin Valley

Wilshire Oil Makes Jacalitos Discovery

Wilshire Oil Co.'s Jacalitos area wildcat, No. 33-26E in sec. 26,21-15, completed in Temblor formation at plugged depth of 3905 ft. pumping 100 bbls. of clean 40.2 gravity oil.

Credited with the discovery of another Fresno county field, the well was drilled near previous tests of the Jacalitos Anticline which lies five miles southeast of the Coalinga townsite and seven miles west of the north tip of the Kettleman North Dome field.

Bottomed at 6031 ft. in barren Cretaceous found at 6025 ft. the well was plugged to 3905 ft. and finished in upper Temblor sands topped at 3885 ft., a total of 20 ft. of formation of which 60 per cent was good oil sand.

Credit for the strike must be accorded Orin Pack, San Joaquin Valley Resident Petroleum Engineer for the company, who worked out the geology so closely that the top of the Temblor was found within one foot of his paper prediction.

The area is fully leased by substantial operators who may be expected to develop the new field in accordance with the best drilling practices.

Amerada Discovery Waits Flow Trial

Discovery of a new high gravity condensate field in Fresno county was assured by the performance on tests of Amerada Petroleum Corp.'s Clover No. 31-34 in sec. 34,16-17, ten miles southwest of the Raisin City field.

Drilled to 10,257 ft. in what was reported as barren Cretaceous the well was plugged to 8005 ft. for the successful trials which indicated a substantial discovery. Gun perforations of a full string of 5½ in. casing at three intervals ranging from 7303 ft. to the plug resulted in formation tester flows varying from 72 to 432 bbls. of 60 gravity clean oil with gas rates as high as 10,000,000 cu. ft., all predicated upon short gauges.

At last report the well was shut in under 2575 lbs. while pipe lines and storage facilities are being provided for final completion.

Like most of California operations the whole general area is blanketed by lease-holders, some of whom are expected to start immediate operations.

Seaboard Completing Joint Fresno Co. Well

Immediately west of established Raisin City production Seaboard Oil Corp. is completing S.T.U. No. 88-13 in collaboration with Tide Water Associated and Union Oil Cos.

Located near the east line of sec. 13,15-17, the well is running some 15 ft. higher than Shell Oil Co.'s adjacent discovery well and is completing in the lower zone which was wet in the original driller. Clean 24 gravity oil was recovered on a shoe test of 7 in. casing cemented at 5122 ft. and the entire zone to bottom at 5138 ft. is expected to be utilized in the completion.

The upper zones were classified as good on trials during drilling down but the lower zone is being taken alone in the apparent hope that the gas-oil ratio may be found more favorable. Oil sands were first found at 4641 ft. with the best shallow zone topped at 4705 ft. Gas sand was cored from 4985 to 4995 ft. with the oil sand being found at 5012 ft. Permeability of the sand is reported to range from 1400 to 5400 millidarcies.

Shell Oil Co. has built rig for its fourth well in the new field, Santa Ana & Fresno Land No. 31-19 in the northwest quarter of sec. 19,15-18.

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
	Fresno County				
Jacalitos Hills	Wilshire Annex Oil Co.	33-26E	26, 3-15	6031	Completed
Raisin City	Amerada Pet. Corp., Clover	31–34	34, 16-17	10257	Completed
	Bandini Pet. Co., S. P.	82–23	23, 15-17	4700	Drilling
	Herndon, Jas. B., Op., Bottoms	1	3, 14-16	5120	Drilling
	Seaboard-T.W.A.-Union, S.T.U.	1	13, 15-17	5138	Completing
	Shell Oil Co., Inc., Santa Ana and Fresno Land	31–19	19, 15-18		Rig
Riverdale	Amerada Pet. Corp., Lawton	45–26	26, 17-19		Foundation
	Kern County				
Belridge—South	Section 27 Oil Co., Aslin	1	27, 28-22	1390	Idle
	Parkford, E. A., Parkford	1	12, 29-21		Prep. to spud.
	Sentinel Oil Co.	1	10, 28-20	3902	Idle
Devils Den	Morton, H. C., Core Hole	1	30, 26-19	2220	Prep. to pump
Grapevine	Kern Line Oil Co.	1	19, 11-19	8390	Idle
Kern Front	Richfield Oil Corp., Kramer	1	34, 28-27	5669	Drilling
McClung	Macrate, A. N., Haberfelde	1	32, 29-26	10828	Drilling
McKittrick	Bryan, J. D., Gamble	1	6, 30-22		Location
Mt. Poso	Alpha Oil Co., C. V. Elliott	1	1, 27-28		Drilling
	Bishop, Bradford	1	22, 27-28	1432	Idle
Paloma	Western Gulf Oil Co., Symons	12–7	7, 32-27	11118	Drilling
Richgrove	Borget, A. J., Kendall	1	16, 25-27	1710	Idle
	Shell Oil Co., Bell	52–27	21, 25-26	6290	Drilling
Round Mt	Pankratz, J., J.P.R., Coffee	1	2, 28-28	1970	Drilling
Shafter	Continental Oil Co., KCL	C–2	35, 27-24	12934	Re-testing
	General Pet. Corp., S.P.	51–15	15, 28-24	10851	Drilling
Shale Hills	The Texas Co., Anderson, Inc.	1	19, 28-20	5049	Drilling
	Tideland Oil Co., Grant Est.	1	4, 27-18		Rigging up
Union Avenue	Hancock Oil Co., Roberts	2	6, 30-28	4292	Completed
	Kings County				
Pyramid Hills	Phillips Oil Prod. Co.	1	13, 24-18		Rig
	Tulare County				
Terra Bella	Stout, Geo. W., Stout	2	11, 23-27	744	Drilling
Trico	Trico Oil & Gas Co., Seymour-Bolz	1	20, 24-23		Rig

Next to complete will be Bandini Petroleum Co.'s southwesterly outpost, S. P. No. 82-23 in sec. 23,15-17, last reported at 5110 ft. and coring for a complete examination of the section.

Some 13 miles to the northwest near the town of Mendota, Sam B. Herndon, Operator is drilling Bottoms No. 1 at 5120 ft. Located in sec. 3,14-16 the well seeks production in the Tranquility area of Fresno county.

Fifteen miles southeast of the Raisin City play near the town of Riverdale, Amerada Pet. Corp. is preparing to drill a new wildcat to be known as Lawton No. 45-26, near the center of sec. 26,17-19.

Parkford To Drill So. Belridge Outpost

E. A. Parkford, oldtime California oil figure, is preparing to drill an outpost near the west quarter corner of sec. 12,29-21 at the southerly tip of the South Belridge oil field. Ivy Drilling Co. will handle the tools on Mr. Parkfords resumption of drilling activity.

Kern Deep Try Near 6000 Ft.

Richfield Oil Corp.'s Kramer No. 1, deep test at the south flank of the Kern Front field, was last reported drilling near 6000 ft. Located in the northwest quarter of sec. 34, 28-27, the test is reported to intend drilling to either production or the basement rock if needs be to properly investigate the section. Thus far the only reported show was poor looking Chanac sand from 2415 to 2480 ft.

Paloma Outpost Finds Showings Near 11,000 Ft.

Western Gulf Oil Co.'s easterly outpost to Paloma production, Symons No. 12-7, cored condensate type oil sand in the interval 10,939 to 10,990 ft., hard sandstone showing oil in the next 5 ft., and then re-entered hard shale which carried to present bottom of 11,172 ft. Since no tests were made the quality of the sands remain an unknown factor.

Located in the northwest corner of sec. 7,32-27 the well lies an almost exact mile east of the nearest production, the company's own KCL No. B-12-12, which encountered its productive zone at 10,248 ft., or 688 ft. stratigraphically higher than the first oil sand in the current well. The positions of the sands in the section are not definitely identified as comparable so no exact correlations or opinions as to structure may yet be drawn.

Shafter Wildcat Nears Objective

General Petroleum Corp.'s Shafter area wildcat, S.P. No. 51-15 in sec. 15,28-24, is probably nearing its first deep potential horizon at 10,851 ft. Presently drilling in hard Cherty shale, which usually overlies the Stevens zone or its equivalent in the San Joaquin Valley, the well should be near the first zone which offers production at depth. Top of the Chert was found at 9726 ft.

Continental Oil Co.'s KCL No. C-2, recently completed wildcat in sec. 35,27-24, died due to mechanical failure and is cleaning out to retest after squeezing at 12,796 ft. with 40 sacks of cement.

Morton Rigging Pump At Blackwells Corner

Harold C. Morton is rigging pump on his Corehole No. 1 in sec. 30, 26-19, south of the Devils Den area and near Blackwells Corner.

Drilled to 2220 ft. in barren Cretaceous found at 2110 ft., the well was plugged to 1000 ft. and 7 in. casing cemented at 848 ft. for a trial of Vaqueros sands thought to be the equivalent of the Belridge 64 zone. With a 5 in. liner containing 152 ft. of pre-gravel packed perforations landed on the plug, the well bailed mud, water and oil and noted a very slow fluid entry.

This is the latest attempt at production in an area long considered

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potentially productive. This opinion was strengthened in 1937 when some oil was recovered on pumping trials two miles northwest of here.

Devils Den Shallow Activity Continues

The flurry of shallow drilling at Devil's Den continues with four operators at work. At present E & S Oil Co. is rigging to pump well No. 1 from 407 ft. in sec. 26,25-18 while Raymond D. Herzog is bailing for production from 617 ft. in LeBaron 5 in section 24.

Meisse & McCabe are drilling Jacquelyn No. 3 in section 26 at 375 ft. and have located No. 4 on an adjacent site. One of the partners in this operation, R. S. Meisse, also participating in Meisse & Owens which is cleaning out the 407 ft. Margaret Smith No. 1 in section 26 and is preparing to spud No. 2 one location southeast of the center of the section.

Alpha Oil Spuds Mt. Poso Wildcat

Three miles east of the Mount Poso field, in the northwest quarter of sec. 1,27-28, Alpha Oil Co. has spudded E. V. Elliott No. 1 and is drilling ahead to test the Vedder zone at this point.

Canal Deep Test Finds Few Shows

Bottomed in shale showing thin streaks of hard, tight oil sand and gray sand at 10,444 ft., Shell Oil Co.'s KCL No. A-44-14 has found its first showings below the normal Canal field horizon.

Drilled in the center of the field, in sec. 14,30-25, the well is attempting to find Vedder production underlying the area, as is the case in some central Valley fields. The driller has already proved the Stevens present and apparently producible at 8050 ft.

Hancock Completes Union Ave. Redrill

After once drilling through to the barren side of a fault at 5203 ft. Hancock Oil Co. directionally redrilled Roberts No. 2 to 4292 ft. and completed flowing 140 bbls. of 26 gravity oil cutting 8.0 per cent fresh water through an 18/64 in. bean. Gas was measured at a 700,000 cu. ft. rate. Located in sec. 6,30-28 at the southerly city limits of Bakersfield, the well is only the second in the field which is geologically complex and apparently relatively small.

Tennessee druggists are substituting kerosene lanterns for neon lights to publicize the southeastern power conservation program.

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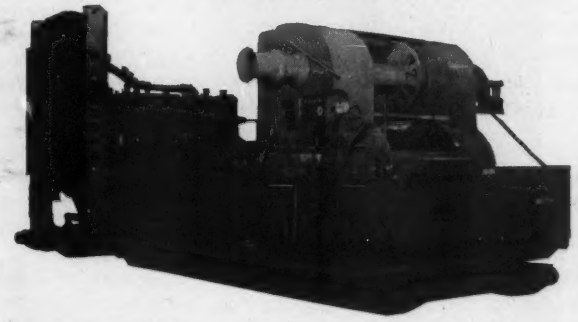

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Cat Canyon Well Makes Swab Test

With bottom at 5175 ft., Alphonzo E. Bell Corp. is making an open hole test in Gilmore No. 1 at Cat Canyon preparatory to completing. A considerable quantity of oil sand was cored in the lower portion of the hole leading observers to believe a good well will be obtained.

Southwest of the Bell holdings, Standard Oil Co. is drilling ahead in Los Flores No. 3 at 5650 ft. after obtaining a water shut-off on 7 in. casing cemented at 5545 ft. Union Oil Co. has not yet rigged up Bell No. 12 on an adjoining lease.

Brain & Kohler Enter Santa Maria Valley

Newest operator to enter Santa Maria Valley is Brain & Kohler, an affilliate of R. R. Bush Oil Co., which is preparing to place the old Rembush well in sec. 35 on production and drill a new hole on the property. Anticipating the move, Bel-Air Oil Corp. has staked an offset location on the Twitchell property to the west.

In the far west area, O. C. Field Gasoline Co. is drilling Brown No. 1 below 3550 ft. while Union Oil Co. is preparing to drill Le Roy No. 8 after completing No. 7 for 440 bbls. a day.

Apex Petroleum Corp. is rigging up to drill its first well on the O'Donnell Subdivision in sec. 28 and Capital Co. preparing to spud its McDonnell No. 2

Alliance, British-American Deepen Ventura Wells

In the Avenue area of the Ventura Avenue field, British-American Oil Producing Co. is deepening its Nos. 8 and 12 and is drilling No. 13, a new well. On the Hartmann Ranch to the north, Alliance Petroleum Corp. is preparing to redrill No. 2 which was originally bottomed at 9499 ft. Following the trend toward reconditioning old wells, Shell Oil Co. is redrilling Edison No. 26, a former producer, and Shell-Lloyd No. A-1 in the northeast section of the field.

Tide Water Associated Oil Co. V. L. & W. No. 5, an old uncompleted well, was recently redrilled from 4100 to 5720 ft. where it was put on production for 250 bbls. of 29 gravity clean oil.

Camulos Wildcat Cores Steep Dips

Coring near the 7000 ft. level, Western Gulf Oil Co. is said to be encountering dips approximating 70 degrees in Rubel No. 1 at Camulos Station in Ventura county. Although no comment is forthcoming from the operators, outside observers believe the test may soon be abandoned.

Security Land Tests Shiells Canyon Well

With 8 5/8 in. casing cemented at 2400 ft. and a perforated liner landed on bottom at 3300 ft., Security Land & Royalty Co. is making a production test in Calumet-Security No. 1 at Shiells Canyon. The well is located near the east end of development in sec. 3,3-19.

Lompoc Wildcat Still in Sisquoc

O. C. Field Gasoline Corp. Careaga No. 1 located north of the east end of the old Lompoc field in sec. 31, 8-33, is drilling below 4800 ft.

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
	Santa Barbara County				
Cat Canyon	Alphonzo E. Bell Corp., Gilmore	1	23, 9-33	6106	Drilling
Lompoc	O. C. Field Gasoline Co., Careaga	1	31, 8-33	4803	Drilling
	San Luis Obispo County				
Huasna	Tex Harvey Oil Corp., Gilmore Comm.	2	11, 32-14	7000	Drilling
	Ventura County				
Bardsdale	Calzoil Co., San Marino	1	7, 3-19		Location
	Hopland Oil Co., Well	1	1, 3-19	3310	Drilling
Camulos	Western Gulf Oil Co., Rubel	1	27, 4-18	6918	Drilling
Conejo	Sycamore Oil Co., Boylan	1	23, 1-20	1350	No report
Ojai	Oil Prod. Maintenance, Inc., Byhara	1	12, 4-22	1200	Drilling
	Richfield Oil Corp., Ojai	44	13, 4-22		Location
Piru	Havlin & Pottenger, Alice	1	33, 4-18	1715	Idle
	Glen Ogles Oil Co., Lisk	1	21, 5-18	1791	Abandoned
Sespe	Inter Counties Fuel Co.	1A	22, 4-19	1200	Idle
	Ivers, H. A., Kentuck	13½	1, 4-20	485	Drilling
	McCaslin, W. E., Burson	1	19, 4-19	2039	Idle
	Rio Hondo Oil Co., Cosby	1	14, 4-19	1695	Prep. to resume
South Mountain	Comstock Pet. Co.	1	17, 3-29	2250	Idle
Timber Canyon	Loose, E. H., & Dietzmann, J.	1	17, 3-20	3625	Drilling
	Denison, A. T., Denison	1	13, 4-21		Rigging up
	Crude Oils, Inc., West	1	19, 4-20	865	Idle
	Henderson-Ortez Oil Co., O'Leary	1	29, 4-20		Rigging up

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Alameda	Shell Oil Co., Nissen	1	7, 2s-3e	5910	Drilling
Colusa	Pacific National Pet. Corp.	1	17, 17n-4w		Rig
Madera	Shell Oil Co., Chowchilla Farms 74–9		9, 11s-14e	9062	Testing
Mendocino	Keyt, N. F.	1	3, 12n-17w	1740	No report
Monterey	Loma Grande Oil Co., Corey	1	23, 24s-10e	3695	Fishing D.P.
Sacramento	Standard Oil Co., Prod. Prpties	1	23, 3n-3e	5750	Testing
San Joaquin	Standard Oil Co., Blewett	3	23, 3s-6e		Location
Solano	Standard Oil Co., Suisun Comm.	1	36, 4n-2w	5395	Idle
	Standard Oil Co., Tippetts	1–1	15, 12n-3w	2490	Stdg. plugged

W. G. Hamilton Promoted By American Meter Co.

American Meter Co. has announced the recent promotion of William G. Hamilton, Jr., to the position of assistant manager of the Philadelphia factory and sales territory, in recognition of his consistent contributions to the production, and sales engineering of the company's products.

William G. Hamilton

After formal education at Penn Charter Academy and Swarthmore College, Mr. Hamilton joined the organization Dec. 1, 1927 with the Helme & McIlhenny factory, which some years ago was consolidated with the John J. Griffin & Co. factory into American Meter Co., 1513 Race St., Philadelphia. Since then he has applied himself extensively with great success particularly in the fields of pressure regulation, flow measurement and flow control, and will continue to specialize on this important phase of the company's engineering service.

He was married in 1933 and is the father of two sons.

A. P. I. Invitation to Nordstrom Oakland Plant

Open house will hold forth at the Nordstrom Valve factory in Oakland during the week of the A.P.I. sessions in San Francisco. An open invitation to all A.P.I. visitors is being extended by officials of Merco Nordstrom Valve Co. and Pittsburgh Equitable Meter Co. to inspect their plant and witness new methods of valve manufacture and testing.

Arrangements have been made to personally escort visitors through the plant at all hours of each day, and officials will devote their entire time in serving as hosts to the many expected guests.

The Nordstrom Valve plant is situated in Oakland at the east approach to the San Francisco-Oakland Bridge and can be reached by car within twelve minutes from the principal San Francisco hotels. A fleet of autos will be available at all times to give courtesy transportation from all hotels, to and from the plant, at the convenience of guests.

Entertainment headquarters of the two companies will be at the Mark Hopkins, Suite 710, atop Nob Hill, and an additional suite has been reserved at the Fairmont, across the street from the former. A.P.I. guests are invited to make these two spots their rendezvous for rest and recreation and are requested to phone the headquarters, Exbrook 3434 for transportation.

Those actively in charge of entertainment and plant tours include Sven Nordstrom; Dave Stratton, general manager of the plant; Russ Waters, Ed Matheson, Ed Hedene, George Scherer and Gilbert Bowman. The contingent of Nordstrom and Pittsburgh Equitable Officials and representatives who are leaving for the San Francisco conclave will be headed by Colonel W. F. Rockwell, president; Captain A. E. Higgins, vice president in charge of sales; H. Boezinger, vice president in charge of West Coast sales; Art Kerr and Jack Cottrell, Tulsa; Don Foster, Pittsburgh; Paul Kruech, Chicago; Carl Madison, Houston; Orville Cochran, Kansas City; and Andy Fomilyant, Ernie Adams and Pete Maxfield, all of Los Angeles.

For the convenience of visitors, maps of San Francisco, showing principal spots, are to be distributed at the hotel rooms of the companies.

Industrial Marketers Open Winter Forum

Details of the fall and winter Marketing Forum, sponsored by the Industrial Marketers of Southern California were announced recently by R. Calvert Haws, account executive of The McCarty Co., who is chairman of the forum.

Opened Oct. 16 with a talk by Kent Moore, lecturer in merchandising and sales management at the University of Southern California, on the "Inter-relationship of Sales and Advertising Management", the forum will consist of twelve evening meetings to be held every other Thursday night.

The second meeting will be the application of the principles set forth in the first lecture. Held in the form of a round table discussion led by Mr. Moore, all members and guests present will participate. A resume of the first meeting will be presented at the opening of the meeting so that if anyone missed the first talk he will be able to familiarize himself with what happened at the previous lecture. Loose-leaf binders will be given to each member for notes, comments and as a start in the building of a study manual

At the third meeting, Dr. P. A. Libby, professor of management and merchandising at the University of Southern California, will discuss "Public Relations Today". This will be followed by the application meeting and round table discussion, and attention will then be devoted successively to Price Maintenance, Advertising, Mass Selling vs. Individual Selling, and Industrial Market Analysis. The following lecturers and professors at the University of Southern California will participate in this forum: W. C. Billig, professor in the school of merchandising; Dr. R. K. Immel, dean of the school of speech; Dr. Frank P. Nagley, professor of marketing and advertising; and Dr. Thurston Ross, head of the school of merchandising.

Designed primarily to acquaint sales managers and advertising men with the fundamentals of their business, the course, however, is open to anybody interested in industrial marketing and advertising. The Industrial Marketers of Southern California, sponsors of the forum, is the local chapter of the National Industrial Advertisers' Association.

Stover Made Chairman Tulsa Oil Industries Group

Howard F. Stover, secretary-treasurer and general manager of the Gaso Pump & Burner Manufacturing Co., of Tulsa,

Howard F. Stover

was elected chairman of the Oil Industries Committee of the Tulsa Chamber of Commerce, at the committee's last meeting, succeeding W. L. James.

Mr. Stover is a former president of the Tulsa Purchasing Agent's Association.

White Motor Co. Promotes Three on Coast

Promotions of three key men in the Pacific Coast Region of The White Motor Co., have just been announced by W. D. Patterson, regional manager. George E. Cruden has been advanced to San Francisco branch manager; Walter G. Auer has been appointed Portland branch manager, and James M. Ball is the new Sacramento branch manager.

Mr. Cruden long identified with White assumes his new duties with a background in the White organization dating back to 1919. That year he joined White as car order clerk. Six years later he entered the Sales Department. Since then, he has been a consistent member of the White Club, with a thorough grounding in both wholesale and retail sales. Previous to his new appointment, Mr. Cruden was national account salesman at San Francisco, in which position he made an outstanding record.

Walter G. Auer moves up to the Portland post from his recent managerial assignment at Sacramento. Mr. Auer originally joined White at Cleveland where he completed the Technical Apprentice Training Course before coming to the Coast in 1936. He served in both retail and wholesale capacities before being appointed Sacramento manager in 1938. His new appointment was the natural outgrowth of the excellent record made in this territory.

James M. Ball goes from the Los Angeles White sales force to become Sacramento branch manager. Mr. Ball has a proven record with White starting in 1926 as a junior clerk in the San Francisco office. A year later he transferred to the Sacramento branch as branch clerk and in 1927, he moved to Los Angeles where he served White in the Credit Department. In 1936, he took his first sales assignment and in 1938 handled both used and new truck sales. Mr. Ball, a thorough White Truck man, is sure to capably represent White in the Sacramento territory.

White's managerial staff on the Pacific Coast also includes W. E. Wilkinson, Los Angeles district manager and D. H. Wilson, Spokane branch manager.

Rex Announces Important Promotions

Chain Belt Co., Milwaukee, has announced the appointment of A. W. Thomas as sales manager of the Construction Machinery Division, D. A. Kalton as assistant sales manager and A. J. Frank as assistant to the manager of the Division. All have been connected with the company for many years and have had extensive experience in the construction machinery field.

A. W. Thomas will succeed B. F. Devine, recently promoted to manager of the Construction Machinery Division. Mr. Thomas, a Civil Engineering graduate of Purdue University in 1925, began his business career in the Illinois and Indiana State Highway Departments, where he had considerable experience in highway work. He joined the Chain Belt organization in 1927 as a member of the company's manufacturing division and later transferred to the engineering division, where he became assistant to the chief engineer. More recently he joined the field sales staff and successively became district manager and assistant to the sales manager.

D. A. Kalton, promoted to assistant sales manager of the Construction Machinery Division, graduated from Marquette University's College of Business Administration in 1932. After graduation, he entered the employ of Chain Belt Co. and has successively held the positions of field salesman, Eastern district manager, and assistant to the sales manager. Mr. Kalton will be in charge of distribution.

A. J. Frank, who was promoted to the position of assistant to the manager of the Division, graduated from Yale University in Industrial Engineering in 1933 and became associated with Chain Belt Co. a year later. Starting out in the student apprentice course, he later served in various capacities in divisional staff work. In 1939 he was appointed sales promotion manager of the Division, a position which he held up to the present time.

Recently the company announced the appointment of G. K. Viall as head of the newly organized Division of Research and Development, which embraces all divisions of the company's business.

The Construction Machinery Division of Chain Belt Co. manufactures the well known line of REX Concrete Mixers, REX Road Pavers, REX Mortar and Plaster Mixers, REX Moto-Mixers, REX Water Pumps, and the REX Pumpcrete.

Vernon Tool-Western Engine Move to Larger Quarters

Vernon Tool Co., Ltd., and Western Engine Co., have moved from their former location to a new, modern and completely equipped plant at 1101 Meridian Avenue, Alhambra, Calif., which they have purchased. This new home provides increased facilities for sales and service of McNeely Vibrating Mud Screens, Corwin-Vernon Desanders, Suter Hydraulic Pumping Units and Western Engines.

Neilsen Pump Appoints Oil Well Supply Company

An announcement of interest to the California oil industry has just been made by Oil Well Supply Co. and Neilsen Pump Co., stating that Oil Well Supply Co. has been appointed a distributor for Neilsen Pumping equipment in the state of California.

The importance of this move may be noted by the fact that Neilsen, one of the oldest independent Sub-surface Pump manufacturers in the State has recently absorbed the Alford Pump Company and is now using in the manufacture of its pump the famous "I-R Metal" which, according to the announcement, is the hardest, densest, toughest, most abrasion-resistant metal used in the construction of any oil well pump on the market.

The extreme hardness and fine grain structure of I-R Metal plus **rifle-honing**, and **superfinishing** to microscopic accuracy make a frictionless, free dropping, metal to metal surface that is smooth operating under any and all pumping conditions.

Neilsen Pumping equipment is now obtainable through Oil Well Supply Company stores in all the oil fields in California. Fast efficient service is maintained by the Neilsen Pump Company at Long Beach and its various factory branches.

Multi-Cylinder Engine Group Meeting Date

The Multi-Cylinder Engine Committee of the American Petroleum Institute will hold the first meeting of its winter series Oct. 30, at the Shell Recreation Hall, at the corner of Hill and Obispo streets, Long Beach, at 7:30 p.m. Fred M. Young, president of Young Radiator Co., Racine, Wisc., has prepared a paper entitled, "Current Solution of Cooling Problems in Various Uses of Oil, Jack Water, and Special Heat Transfer Applications." In case Mr. Young finds he cannot be present to deliver his paper, it will be presented by A. R. Flournoy, local representative of the Young Radiator Co., and Mr. Young will send Lawrence Skelly here from the Racine office to handle the discussion.

Mr. Young writes authoritatively on cooling equipment and problems and the Committee is very fortunate to be able to present a man so well qualified for his subject. Paper is accompanied by thirty-seven slides.

All parties interested are invited to attend.

New washable, suede-finish gloves of vinyon, the petroleum-fabricated fiber, wear three times longer and don't shrink, stretch or bag.

Two Californians on Stripper Committee

Announcement of the appointment of Robert C. Davis, Davis Investment Co., and Richard Fenton, Alford Oil Co., to

Robert C. Davis

the Executive Committee of the National Stripper Well Association, was made recently by A. D. Mitchell, president of the California Stripper Well Association.

Richard Fenton

Both Mr. Davis and Mr. Fenton are officers of the California oil industry trade group headed by Mr. Mitchell, Mr. Davis being vice president and Mr. Fenton, executive vice-president. In addition to being appointed to the Executive Committee of the National Association, Mr. Davis was named to the Committee on Constitution and By-Laws, and Mr. Fenton to the Committee on Credentials, Rules, and Order of Business. Mr. Mitchell likewise will serve the National Association as a member of its Nominating Committee and the Resolutions Committee.

Appointment of the prominent California oil men to the national trade group committees was expected to bring stripper well problems of California into the forefront of discussions scheduled for the annual meeting of the National Stripper Well Association held Oct. 20, 1941, at Tulsa, Oklahoma.

Price Publishes Richgrove Maps

Since the discovery of production by Shell Oil Co.'s Smith No. 56-X-11 in sec. 11,26-27, California Oil World has received many inquiries regarding maps of the area. These inquiries have been referred to the Earl M. Price Co. of Bakersfield, which publishes excellent maps covering the Richgrove, Jasmine and Mount Poso areas.

News Briefs of No. California

Shell Oil Co.'s Nissen No. 1, test of sec. 7,2s-3e in the Altamont area of Alameda county, is presently, fishing a tester tail piece which dropped during the trial of the interval 5809 ft. to bottom at 5910 ft. No tangible results had been obtained prior to the mishap.

The company's deep try in the Chowchilla area of Madera county, Chowchilla Farms No. 74-9 in sec. 9,11s-14e, is preparing to cement a liner for a trial on gas shows to plugged bottom at 3586 ft. Bottomed at 9062 ft. in schist found at 9045 ft. the well flowed only salt water with a trace of gas on formation test of the interval 8752 to 8823 ft.

In the Bradley area of Monterey county, Loma Grande Oil Co.'s Corey No. 1, sec. 23,24-10, is completing a drill pipe fishing job and may soon be deepening from present bottom at 3695 ft.

Standard Oil Co.'s Suisun Comm. No. 1, sec. 36,4n-2w, in the Suisun Bay area of Solano county, is suspended at 5395 ft. in grayish sandy shale. Standard's Rumsey Hills try, Tippetts No. 1-1 in sec. 15,12n-13w, is not looking so good and may be abandoned. Bottomed at 2490 ft. in silty gray sand the well is now standing plugged to 2438 ft. Top of the Funk shale was found at 1130 ft. and a 60 ft. sand section tentatively identified as Franciscan was entered below 2315 ft.

Operations in the Rio Vista gas field are represented by four strings, one of Amerada Pet. Corp. and three of Standard Oil Co. One of these, Standard's southerly outpost, Productive Properties No. 1 in sec. 23,-3n-3e, is bottomed at 5750 ft. after a formation test from 5440 to 5561 ft. recovered only salt water. Similar results were obtained on trial at 4040 ft.

Brown Instrument Co. Supplemental Catalog

The Brown Instrument Co., Philadelphia, Penna. has just issued a new catalog —"Thermometer and Pressure Gauge Accessories".

In the Brown Thermometer, Hygrometer and Pressure Gauge Catalogs, specifications and operating principles of the numerous types and models of instruments are fully covered. This new catalog is presented as a supplement, listing and describing bulbs, sockets, tubing and accessory items for the complete line of Brown Thermometers and Pressure Gauges.

All information and specifications contained in the catalog have been compiled with the idea of making it easy to order the proper accessory direct from the catalog. Descriptions of the various items mention part numbers, sizes, spans, maximum tubing lengths, etc.

The catalog is handsomely illustrated with actual photographs of the various accessories used with Brown Thermometers and Pressure Gauges. Photographs show bulbs, tubing extension necks, separable sockets, wrought iron sockets and fittings, wet and dry bulb assemblies, pulsation checks, oil seals, gauge cocks, charts, etc.

The contents of this catalog are not limited to mere product description. Such sections as those on application, arrangement, connections, etc. make it a handbook of practical data for the engineer.

A copy of this catalog will be sent to any readers who may request it. Ask for Catalog No. 6706-A. Address: The Brown Instrument Co., Wayne & Roberts Aves., Philadelphia, Penna.

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FOR LEASE

5,000 acres S. of Taft—5 yr. leases—part or all. Oil seepages and 15 Structure area. Maps and geologist's report furnished free. Land joining will be drilled this year. Asking only $3 per acre and 3 bbls. per 100 working agreement, or examine and make your bid by Oct. 21st. Fred G. Delker et al, 2107 W. Tioga St., Philadelphia, Pa. 10/20d.

FOR SALE

KEW MAP—COMPLETE WITH BULLETIN NO. 753 VENTURA AND LOS ANGELES COUNTIES. ADDRESS: 6418½ Atlantic Blvd., Bell, Calif. 10/20d

Stout Continues Tulare Wildcat

Geo. W. Stout's cable tool job in sec. 11,23-27 of Terra Bella district in Tulare county is reported bottomed in oil sand grading to gray sand topped at 730 ft. The hole is protected by 8-5/8 in. casing to 662 ft. and a 6-5/8 in. carrying string will be cemented in place before testing.

Pat Kinard Drills San Pablo Wildcat

P. A. (Pat) Kinard, former Los Angeles oil man, is drilling an interesting well in the Sobrante area adjoining the Standard Oil Co. tank farm near San Pablo. The present test, last reported at 617 ft., is located approximately 1000 ft. south of an old 485-ft. hole in which oil stands at 80 ft. Analysis of the product of the first well is said to show a 52% lube fraction and a 12% kerosene cut. The second well is being carried through the shallow Miocene oil strata to test the Eocene which should be reached between 2000 and 3000 ft. according to Mr. Kinard.

Coles Levee Well Proved Failure

Near the center of sec. 2,31-25 at the easterly flank of the Coles Levee field Union Oil Co. abandoned Kern-co No. 56-2 at 10,101 ft. after repeated tests succeeded only in producing gassy salt water. Located only one unit from production, the failure indicates a definite and controling disturbance along this flank.

No Showings in Richgrove "Cat"

Shell Oil Co.'s current wildcat in the Richgrove area, Bell No. 52-21 in sec. 21,25-26, is drilling without showings at 6290 ft. At press time there was little probability that the well would be carried much farther.

Oil Men's Calendar

Calif. Natural Gasoline Association. Los Angeles Chapter—Meets 1st Thursday Each Month, Barker Bros. Bldg., Los Angeles—Dinner at 6:00 (Optional). Taft Chapter—Meets Third Thursday Each Month.

American Society of Mechanical Engineers—Los Angeles Section—Meets 2nd Thursday Each Month—Barker Bros. Bldg., Los Angeles. Dinner at 6:30 (Optional).

October

29-30—American Institute of Mining & Metallurgical Engineers, Petroleum Division, Los Angeles, Calif.

30-Nov. 1—Society of Automotive Engineers, National Aircraft Production Meeting, Biltmore Hotel, Los Angeles, Calif.

31—California Natural Gasoline Assn., Los Angeles, Calif.

November

3-7—American Petroleum Institute, 22nd Annual Meeting, St. Francis and Palace Hotels, San Francisco, Calif.

December

3—New Mexico Oil & Gas Assn., Artesia, New Mexico.